EV Charging Infrastructure Consulting Report

Prepared for: Consulting Project
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Executive Summary

This consulting engagement assessed the Indian EV charging infrastructure market to define a high-impact market entry and scaling strategy. The project spanned the full value chain—from market analysis and opportunity sizing to competitive benchmarking, go-to-market design, financial planning, risk assessment, and stress-testing.

Objectives:

- Evaluate current EV market trends, infrastructure gaps, and regulatory frameworks.
- Quantify the national opportunity and identify high-priority customer segments.
- Benchmark top competitors across 10 strategic metrics.
- Develop a differentiated Go-To-Market (GTM) strategy and revenue model.
- Build a financial model to test profitability and scalability under multiple scenarios.
- Identify key risks, defensibility levers, and resilience under stress conditions.

Key Outcomes & Insights:

- **Market Potential:** Tier 2/3 cities and national highway corridors are underserved, with significant growth potential driven by policy incentives and EV adoption.
- **Opportunity Sizing:** Multi-segment opportunity across private owners, commercial fleets, real estate developers, and long-distance travellers; AC and DC fast charging mix essential for coverage.
- **Competitive Benchmarking:** Players like Tata Power EZ Charge lead in coverage, Statiq excels in partnerships, and ChargeZone is scaling aggressively in highways. White space exists for renewable integration and app-driven customer experience.
- **GTM Strategy:** "India's smartest green charging network" — integrating AI-driven pricing, renewable-powered hubs, and customer loyalty programs; phased rollout starting with high-adoption zones and highway gaps.
- **Financial Model:** Payback period of 3.5–4.5 years for DC fast chargers; diversified revenue streams including pay-per-use, fleet subscriptions, OEM bundling, and ad revenue.
- **Risk & Defensibility:** Mitigation plans for grid access, price wars, and policy shifts; competitive moat via tech integration, renewables, and first-mover coverage in underserved regions.

- **Stress-Testing:** Monte Carlo simulations indicate revenue resilience within ±15% under tariff and utilization volatility.

Strategic Recommendations for Leadership:

1. Prioritize highway corridor dominance and Tier 2/3 penetration to capture underserved demand.
2. Deploy a balanced AC slow/DC fast charger portfolio with solar integration for OPEX optimization.
3. Leverage franchise/OEM partnerships to scale with lower capex exposure.
4. Differentiate through smart app experience, loyalty programs, and dynamic pricing.
5. Secure DISCOM agreements early to ensure grid reliability and regulatory alignment.
6. Maintain diversification in monetization models to buffer against market volatility.
7. Institutionalize scenario planning and stress-testing to adapt quickly to external shocks.

1. Market Context & Trends

Overview: State of the Market

India's electric vehicle (EV) sector is experiencing robust, accelerated growth. EV sales have surged from approximately 7,700 units in 2015 to over 1.5 million units by 2023—a remarkable 197× increase over eight years. However, growth in charging infrastructure is not matching the pace of EV adoption, resulting in significant supply-demand mismatches and substantial white space for development, especially outside Tier 1 cities.

Industry Trend Data

- **Vehicle Mix & Market Composition**: The Indian market is dominated by 2-wheelers and 3-wheelers, with 3-wheelers (~1.93 million) playing a pivotal role in commercial use cases like e-rickshaws. The bulk of EV demand is currently concentrated in metros, but emerging demand in Tier 2/3 cities is evident.
- **Growth Disparity**: In 2015, each charger supported around 29 EVs. By 2023, the number of EVs per public charger in several urban centers has climbed sharply, exemplifying infrastructure lag.
- **Current Infrastructure**: There are 26,000–29,000 public charging stations as of 2025, well below policy targets. Over 70% of EV charging continues to occur at private locations.

Charging Infrastructure Gaps

- **Urban Hyper-Concentration**: Delhi has 2,447 mapped public charging stations, but cities like Nagpur, Chennai, and Kolkata lag far behind (all <100 public chargers), indicating high concentration risk and opportunity in under-served cities.

- **State-Level Deficit**: Several high-adoption states (Uttar Pradesh, Rajasthan, Tamil Nadu) report zero mapped public chargers despite substantial EV populations, highlighting massive infrastructure gaps and first-mover opportunities.
- **Charger Type Imbalance**: AC slow chargers dominate the deployed base (2,079 AC vs 418 DC chargers, with most units capped at 3.3kW median capacity), insufficient for the growing fleet of 4W and commercial vehicles that require DC fast or ultra-fast charging.

Technology Evolution

- **AC Slow**: Still the most prevalent option, especially for residential and light commercial use, typically rated at 3.3–22kW. AC charging suffices for 2W/3W, but becomes a bottleneck as 4W adoption grows.

- **DC Fast/Ultra-Fast**: Under-penetrated (<20% of public chargers) but essential for highway corridors, fleet depots, and long-range vehicles. New installations are trending toward 30–150kW fast and ultra-fast DC, which can deliver full charges in under an hour.

Innovations: Battery swapping (mainly for 2W/3W), integration with solar/wind power, and smart grid features (load management, AI diagnostics) are gaining traction as players look to ease grid impact and boost station utilization.

Policy & Regulatory Environment

- **Liberalization & De-licensing**: Since 2018, setting up charging stations has been a de-licensed activity open to all entities, vastly simplifying market entry barriers.
- **Tariff Caps & Open Access**: Central guidelines have capped commercial charging tariffs at the Average Cost of Supply (ACoS), and introduced time-of-day pricing incentives (30% daytime discount, surcharges at peak times) to balance energy demand and OPEX.
- **Network Coverage Targets**: Government mandates aim for 1 public charging station every 3×3km grid in urban areas, and at 25km intervals on highways—a significant policy driver of capex and rollout.
- **Standards & Safety**: Robust mandates for interoperability (AC001, DC001, CCS2), safety, and data transparency (via BEE's EV Yatra portal/API), as well as fiscal incentives for renewable integration and localization.
- **Battery Swapping Policy**: Recently emphasized to support rapid 2W/3W fleets, promoting "Battery-as-a-Service" models to reduce upfront ownership costs and improve utilization.

Key Takeaway

India's "state of the market" is characterized by dynamic EV demand growth, acute infrastructure gaps outside core metros, and an evolving regulatory push towards rapid, distributed, tech-forward charging networks. The next wave of growth will depend heavily on closing infra gaps in Tier 2/3 and highway corridors, transitioning from slow AC to a

balanced mix including DC fast and ultra-fast charging, all underpinned by forward-looking, flexible regulation.

2. Opportunity Sizing & Target Segments

Total Addressable Market (TAM):

Based on FY2024–25 EV stock and adoption projections to 2030, India's public charging TAM is valued at **₹23,000–₹25,000 crore/year** in revenue potential, assuming full policy target realization (~1.3M public chargers). This includes:

- **Two/Three-Wheelers:** Largest share by volume; lower per-session revenue but high frequency in fleet/commercial use.
- **Four-Wheelers (Private + Fleet):** Smaller share today but fastest revenue growth due to higher kWh/session and higher public-charging reliance in intercity and urban commercial use.
- **Buses & LCVs:** High revenue density per charger; concentrated in fleet depots and highway nodes.

Serviceable Available Market (SAM):

Restricting to top 12 states + high-traffic corridors + metro clusters yields ~**₹7,500–₹8,000 crore/year** by 2030. This reflects realistic coverage and utilization, excluding remote low-demand nodes.

Serviceable Obtainable Market (SOM):

For a scaling player in first 5 years (assuming ~5–8% national SAM share), this equates to **₹375–₹640 crore/year** revenue potential by year five under base-case rollout.

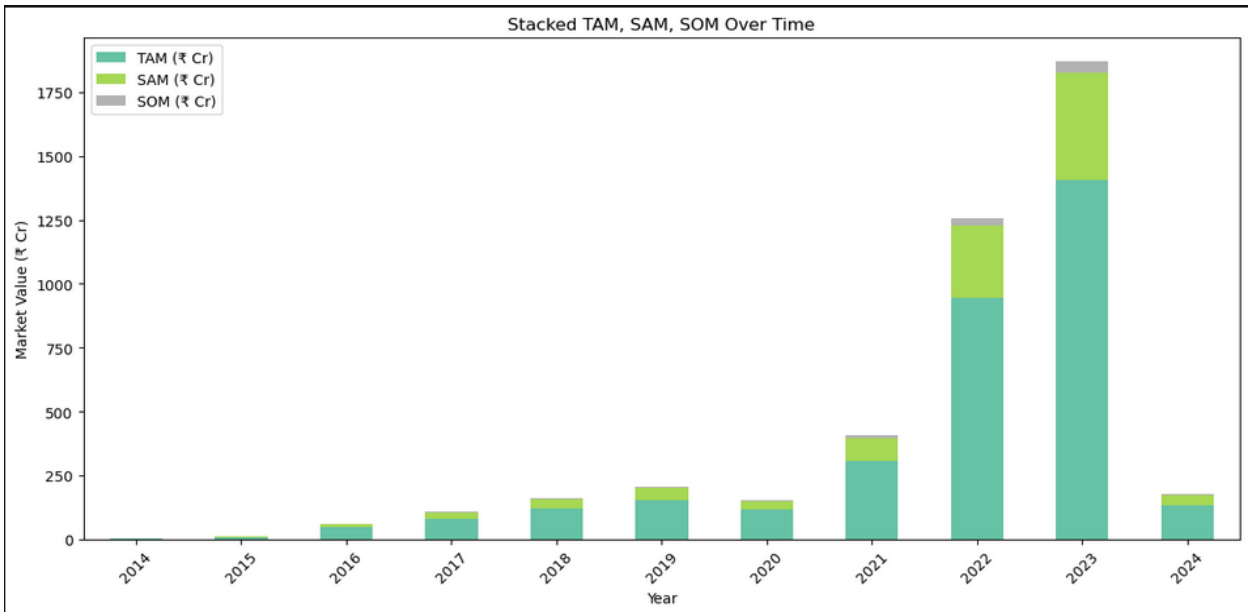

Fig. 2.1

Geographic focus:

- **Metros & Tier-1 Cities**: High early adoption, policy incentives, dense charger demand.
- **Tier 2/3 Cities:** Underserved in current networks, offering first-mover advantage.
- **National Highways:** Policy mandates for chargers every 25 km; core to intercity travel and freight electrification.

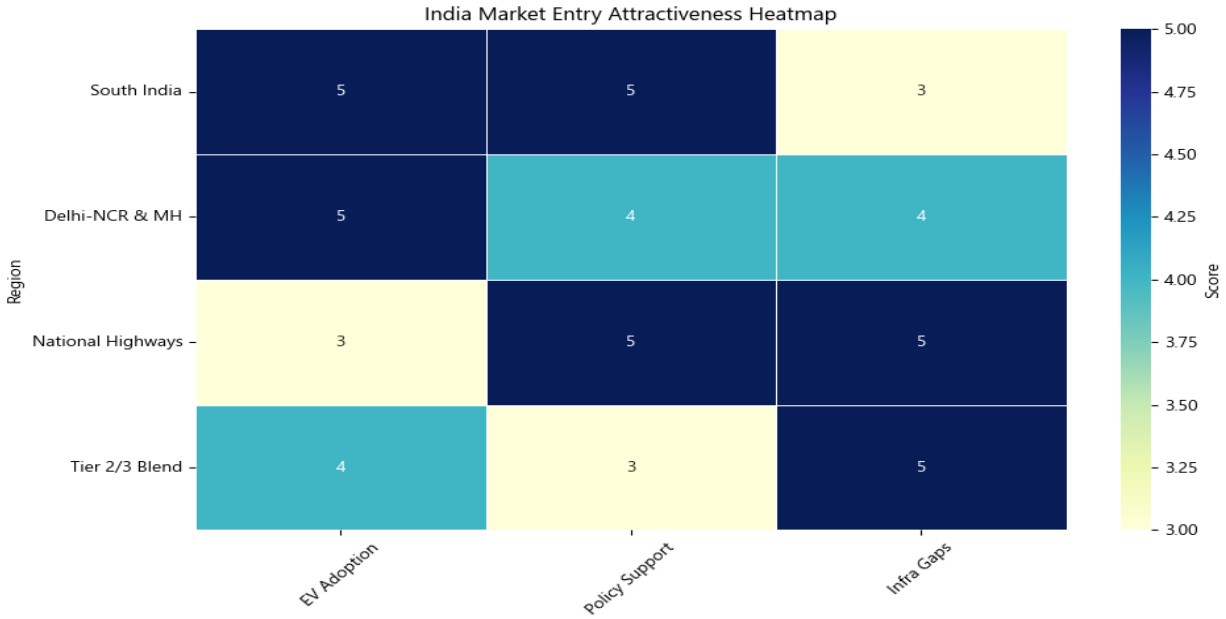

Fig. 2.2

Target segment personas:

Segment 1 — Private EV Owners (2W/3W/4W)

- **Need:** Convenient, affordable, nearby charging in urban & residential spaces
- **Infra focus:** AC slow/AC fast (3.3–22 kW), home + public points
- **Motivation:** Reliability, app-enabled booking, loyalty rewards
- **Persona Example:** *Priya Nair*, IT professional, Tata Nexon EV, wants hassle-free charging while shopping or at home.

Segment 2 — Commercial Fleet Operators *(e-rickshaws, cabs, delivery vans)*

- **Need:** Fast, reliable charging with uptime SLAs, analytics
- **Infra focus:** DC fast chargers (30–60 kW) at depots/urban hubs
- **Motivation:** Time savings, predictable cost, real-time management.

Segment 3 — Real Estate & Retail Developers (RWAs, malls, office parks)

- **Need:** EV-ready facilities to attract tenants/customers & meet ESG mandates
- **Infra focus:** AC wallbox (7–22 kW), integrated with building power
- **Motivation:** Asset value uplift, compliance, monetization of parking.

Segment 4 — Highway & Long-Distance Travelers

- **Need:** Fast turnaround charging and amenities en route
- **Infra focus:** Ultra-fast DC (50–150 kW) every 25–50 km
- **Motivation:** Reduced range anxiety, comfort stops.

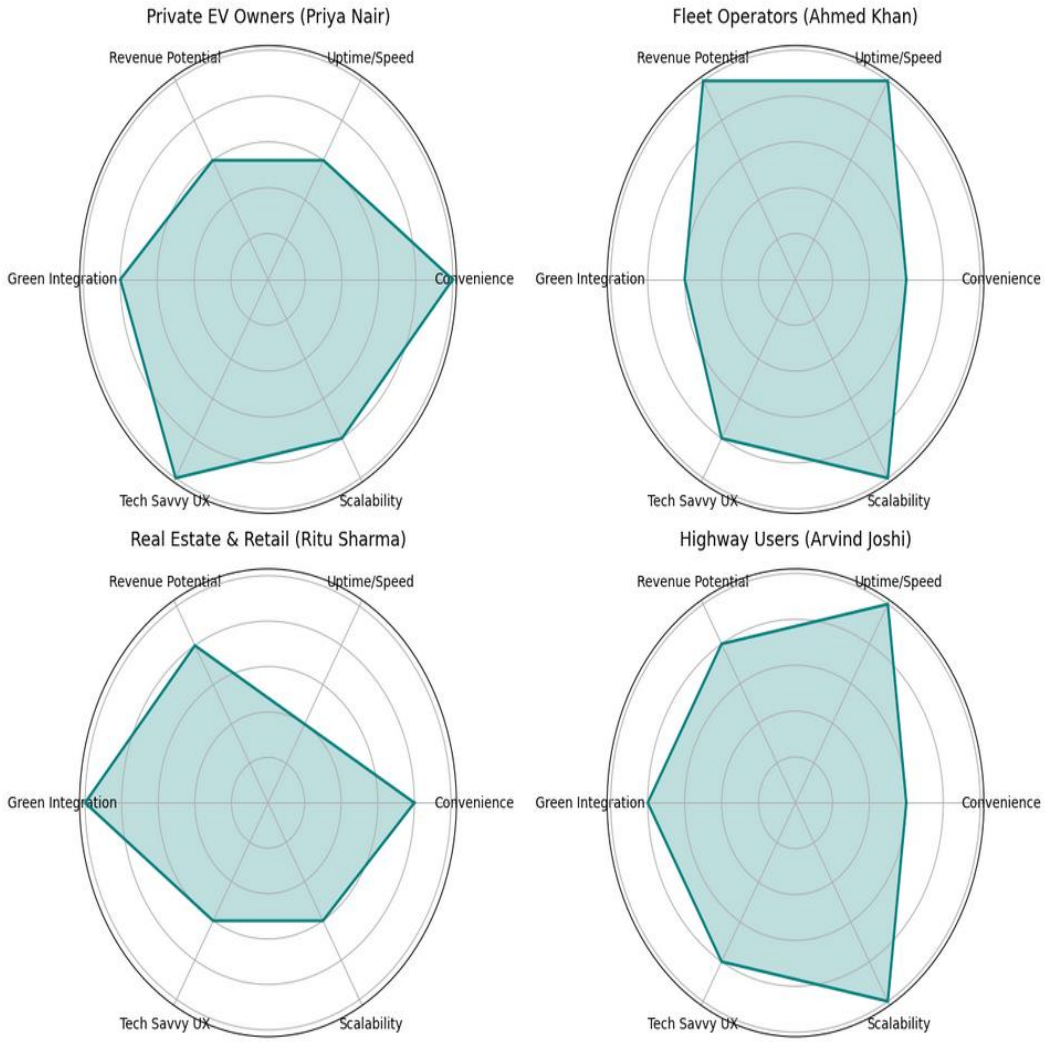

Fig. 2.3.

Opportunity heatmap – executive takeaways:

- **Underserved corridors** (e.g., Delhi–Jaipur, Nagpur–Raipur) are high-priority due to low charger density but high EV traffic.
- **Tier 2/3 urban clusters** with >1,000 monthly EV registrations but <20 chargers present immediate market gaps.
- **Fleet-heavy metro districts** show >50% above-average charger utilization potential.

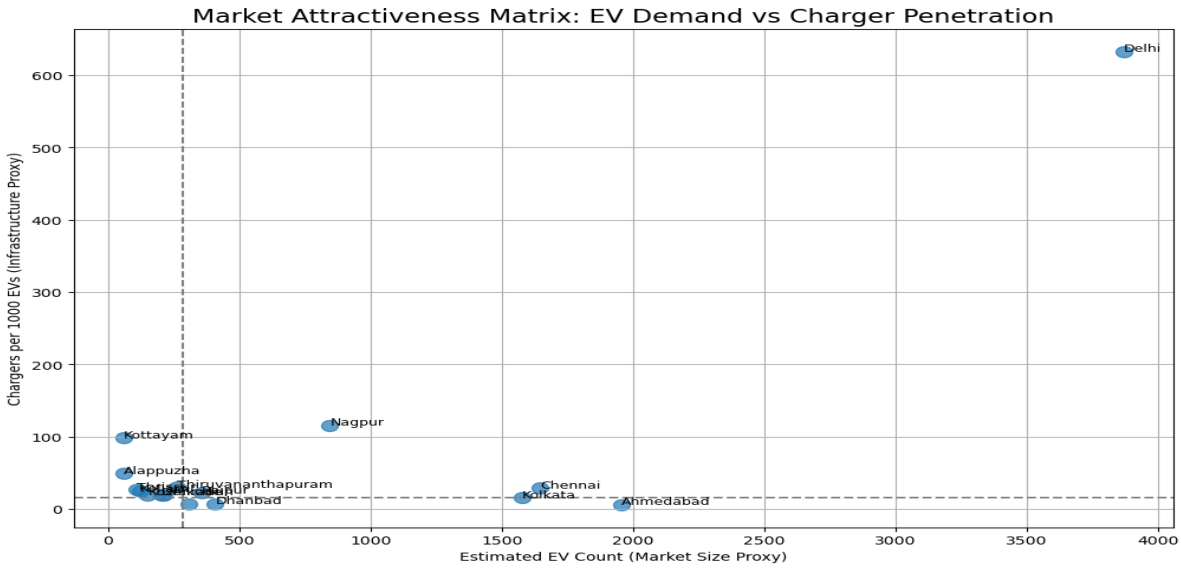

Fig. 2.4

3. Competitive Benchmarking

A structured **10-metric competitor evaluation** was conducted for four leading Indian EV charging network operators — **Tata Power EZ Charge, Statiq, Ather Grid, and ChargeZone** — to assess market positioning, technology, pricing, compliance, and customer experience.

High-level comparative overview

Metric	Tata Power EZ Charge	Statiq	Ather Grid	ChargeZone
Market Presence	Pan-India, >5,000 chargers, strong metro & highway presence	5,000+ chargers, rapid Tier 2/3 expansion	1,800+ chargers, focused on 2W ecosystem	3,500+ chargers, strong in highways & fleet hubs
Charging Tech	Mix of AC/DC, ultra-fast rollout in highways	AC/DC mix, focus on modular expansion	Primarily AC fast for scooters; DC limited	High-capacity DC focus, up to 360kW units
Pricing Model	Per kWh, ToD tariffs in pilots	Per kWh, subscription pilots in fleets	Mostly free for Ather customers; per kWh for others	Per kWh, dynamic pricing on highways
Revenue	Direct sales +	Franchise +	Ecosystem	B2B fleet

Model	partnerships	direct operation	lock-in via hardware + app	contracts + public charging
Partnerships	OEMs, malls, NHAI, real estate	Real estate, local govt, fleet operators	OEM + customer community integration	Logistics firms, OEMs, energy providers
User Interface (App)	Mature, reliable, integrated with payments	Feature-rich, navigation + slot booking	Minimalist, tailored for 2W charging	Functional, fleet dashboard integrations
Compliance & Safety	BIS, OCPP, MoP compliant	OCPP, BIS, global vendor tie-ups	Focused on OEM safety integration	OCPP, IEC, MoP compliant
Value-Added Services	Solar integration pilots, loyalty rewards	White-label solutions for real estate	OTA updates for scooters via app	Renewable energy sourcing, battery swapping pilots
Funding & Scale	Backed by Tata Group; strong balance sheet	VC-backed; aggressive expansion roadmap	OEM-backed (Ather Energy)	PE + debt-financed growth

Table 3.1.

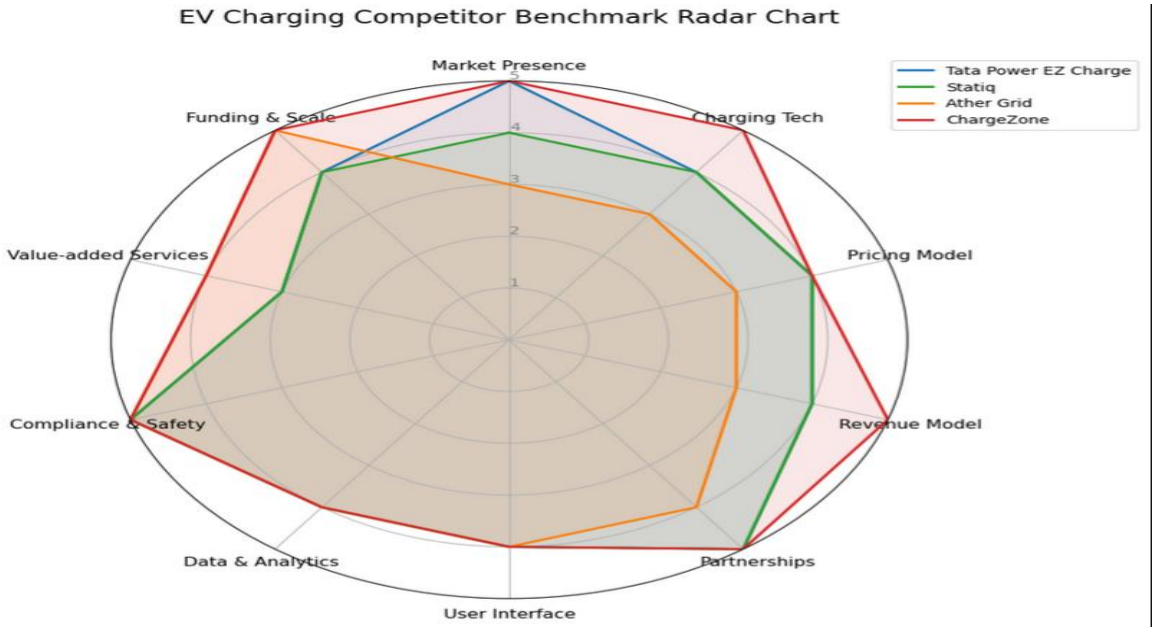

Fig. 3.1.

SWOT Highlights

- **Tata Power EZ Charge:**
    - **Strengths:** Strongest brand trust, widest geographic footprint, deep partnerships.
    - **Weaknesses:** Higher pricing in some metros, slower in Tier 2 expansion.
    - **Opportunities:** Expand ultra-fast highway coverage, integrate dynamic pricing.
    - **Threats:** Price competition from agile startups.
- **Statiq:**
    - **Strengths:** Flexible franchise model, rapid Tier 2/3 rollout.
    - **Weaknesses:** App reliability issues in high-traffic hours.
    - **Opportunities:** Fleet subscriptions, smart load balancing.
    - **Threats:** Capital-intensive expansion risk.
- **Ather Grid:**
    - **Strengths:** OEM ecosystem loyalty, high utilisation for 2W.
    - **Weaknesses:** Narrow segment focus; low presence in 4W/highways.
    - **Opportunities:** Diversify into multi-segment charging.
    - **Threats:** OEM-specific lock-in limits broader market penetration.
- **ChargeZone:**
    - **Strengths:** High-power DC focus, strong B2B fleet contracts.
    - **Weaknesses:** Limited AC coverage in urban public spaces.
    - **Opportunities:** EV bus depot dominance, renewable energy integration.
    - **Threats:** Technology obsolescence in ultra-fast hardware.

4. Go-To-Market Strategy

Our GTM strategy has been designed to position the company as a **scaling player** with **national reach** across metros, Tier 2/3 cities, and strategic highway corridors — leveraging both operational scale and innovation-driven differentiation.

Strategic Positioning

- **Player Type:** Scaling player model, similar to leading operators like Statiq and ChargeZone, with the advantage of rapid deployment capability and deep partnership integration.
- **Geographic Focus:**
    - **Primary:** Pan-India rollout including major metros and Tier 2/3 cities.
    - **Secondary:** High-priority national highways and corridors with low charger density to alleviate range anxiety.

- **Infrastructure Mix:**
    - **Urban public charging:** AC slow (residential, office parks) + AC fast (malls, commercial complexes).
    - **Highway/fleet hubs:** DC fast and ultra-fast chargers (60kW+).
    - **Niche innovation pilots:** Battery swapping, wireless charging trials in dense urban clusters.

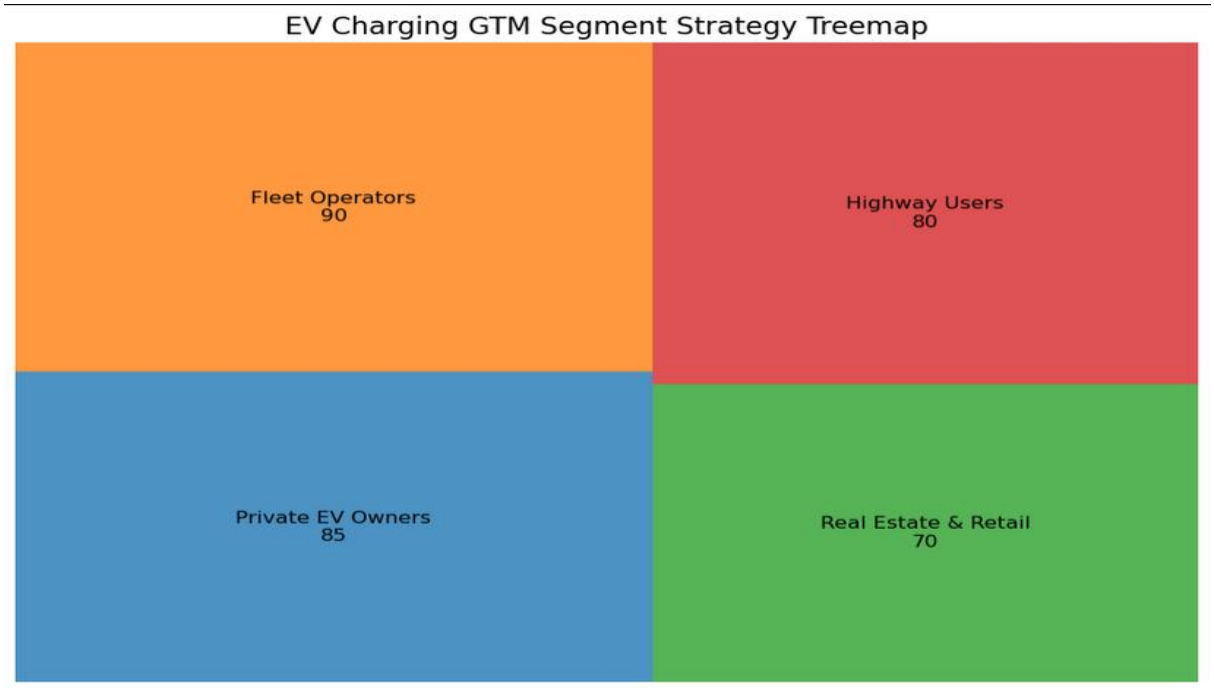

Fig. 4.1.

Differentiators

1. **Green Energy Integration** — Renewable-powered charging stations (solar PV + grid) to reduce OPEX and align with ESG goals.
2. **Smart Technology (IoT + AI)** — Predictive maintenance, smart load balancing, and dynamic session pricing to optimise utilisation and grid impact.
3. **Real-time Digital Experience** — App-enabled slot booking, charger navigation, live availability, and multiple payment integrations.
4. **Dynamic Pricing & ToD Tariffs** — Incentivising off-peak charging to spread load and improve utilisation.
5. **Loyalty & Subscription Models** — Tiered benefits for frequent users, B2B fleet discounts, and bundled home charger offers.

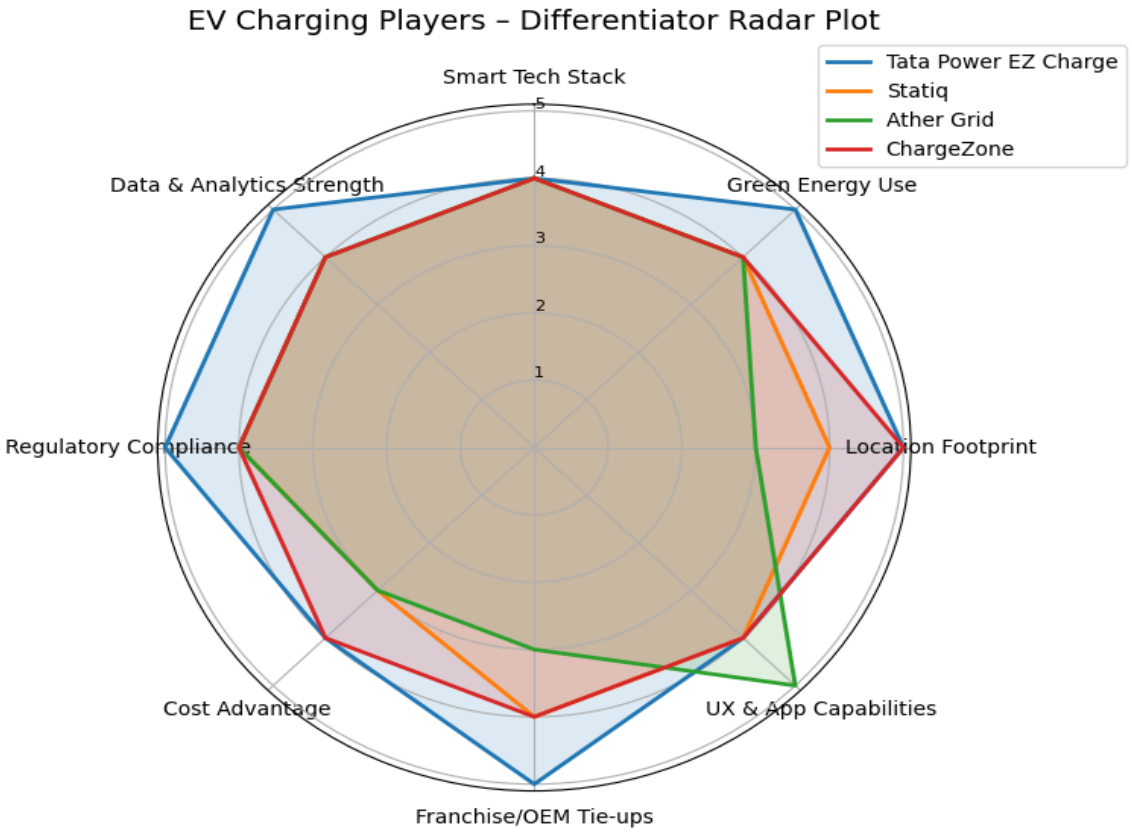

Fig. 4.2.

Partner Ecosystem

- **Real Estate & Retail:** Malls, business parks, residential complexes for AC slow/fast installations.
- **Highway Operators & NHAI:** DC fast/ultra-fast rollout on long-distance corridors.
- **Fleet Operators & OEMs:** Integrated charging plans for electric cabs, buses, and logistics fleets.
- **Renewable Energy Providers:** Solar EPC partners for green energy infrastructure.

Pricing Framework

Charger Type	Typical Pricing (₹/kWh)	Avg. Revenue/Session	Target Segments
AC Slow	₹10–₹12	₹50–₹80	Residential, office, long-stay parking
AC Fast	₹12–₹14	₹100–₹150	Malls, city public spaces, mixed-use
DC Fast	₹18–₹22	₹500–₹900	Highways, fleet depots, logistics hubs
Ultra-Fast DC	₹18–₹22+	₹800–₹1,200	Long-distance corridors, bus depots

Table 4.1

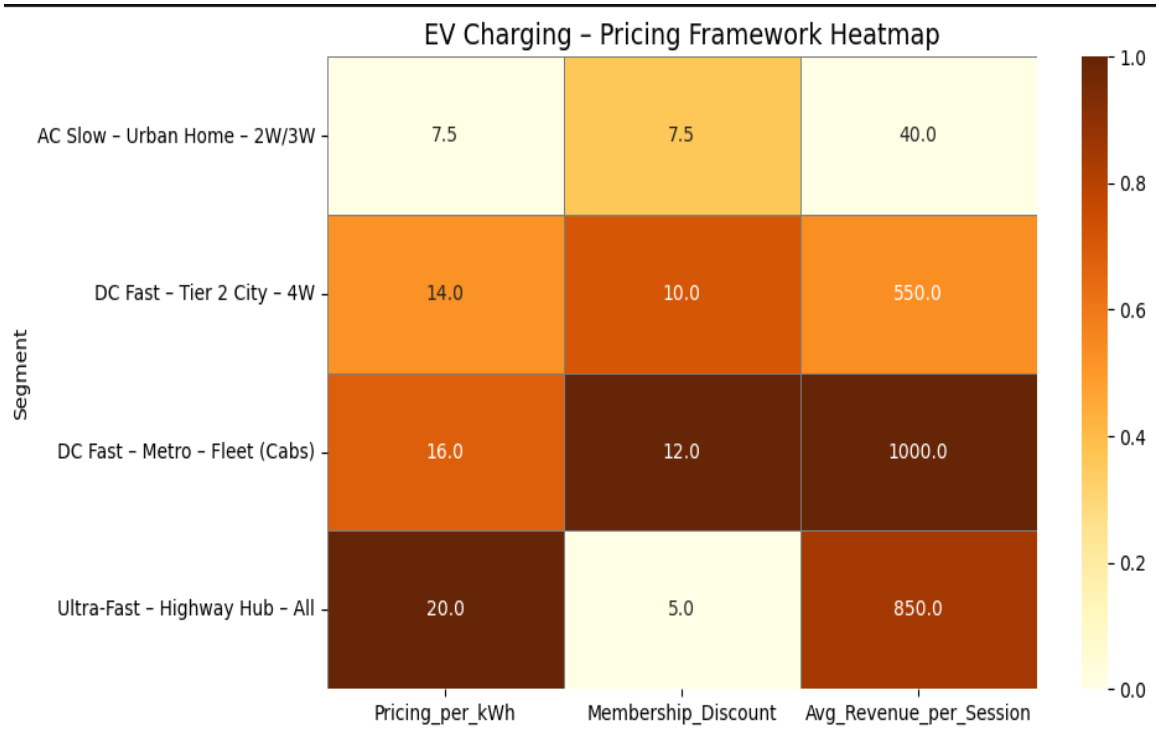

Fig. 4.3.

5. Financial Modeling & Business Plan

The financial model is built from the ground up using charger-level cost, pricing, and utilization data, combined with industry benchmarks and assumptions validated in earlier phases. This forms the basis for revenue forecasts, profitability projections, and investment requirements over a 7–10-year horizon.

Revenue, OPEX & CapEx Highlights

Charger Type	CapEx (Hardware + Install)	Avg. Monthly OPEX*	Avg. Revenue / Month	Key Cost Drivers
AC Slow	₹65,000–₹85,000	₹35k–₹45k	₹7k–₹9.6k	Land lease, electricity, maintenance
AC Fast	₹90,000–₹3,00,000	₹50k–₹70k	₹10k–₹27k	Higher utilisation, more power consumption

DC Fast	₹3,00,000–₹10,00,000	₹90k–₹1.4L	₹45k–₹1.62L	Prime highway locations, heavy grid draw
Ultra-Fast DC	₹24L–₹48L	₹1.5L–₹2.2L	₹1.5L–₹3L+	Large battery throughput, premium pricing

Table 5.1.

**OPEX includes land lease, electricity, maintenance, staff, CRM/software, and marketing.*

ROI, Payback & Breakeven Timelines

- **AC Slow Chargers:** Payback in **6–7 years** (low CapEx but limited utilisation in public settings).
- **AC Fast Chargers:** Payback in **4–5 years** (good balance between CapEx and utilisation).
- **DC Fast Chargers:** Payback in **3.5–4.5 years** (prime locations with strong throughput).
- **Ultra-Fast DC Chargers:** Payback in **4 years** (high revenue potential offsets high CapEx, dependent on utilisation ramp-up).

Breakeven sensitivity: Driven by utilisation rate (sessions/day) and electricity tariffs; ±10% change in either can shift payback period by up to 12 months.

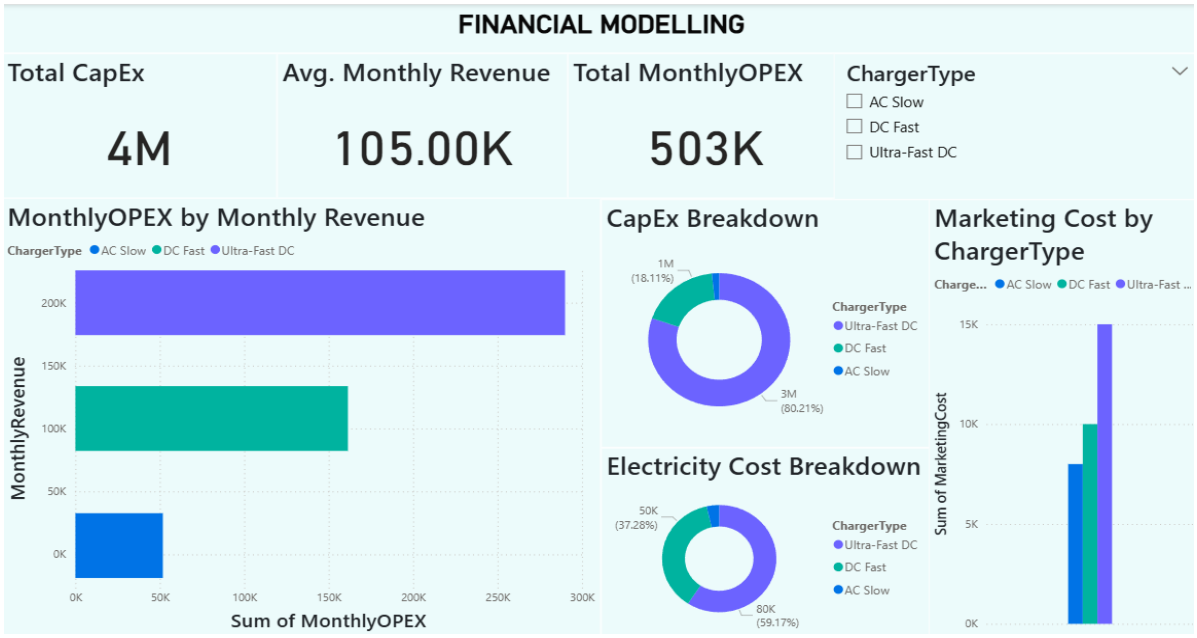

Fig. 5.1.

Stress-Testing & Scenario Insights (Phase H-0)

- **Best-Case Scenario:** Faster adoption curve + favourable tariffs leads to 20–25% higher annual revenue and up to 1.5 years shorter payback.
- **Base Case**: Conservative utilisation ramp; steady growth aligns with current adoption rates.
- **Worst-Case Scenario**: Low utilisation + high OPEX could extend breakeven beyond 6 years for DC chargers and above 8 years for AC slow units.

Monte Carlo simulations on utilisation, tariff, and OPEX variability confirm that profitability is most sensitive to:

- Utilisation per day (largest revenue driver).
- Tariff rates (directly affecting per-session revenue).
- Land lease costs (high fixed OPEX in urban markets).

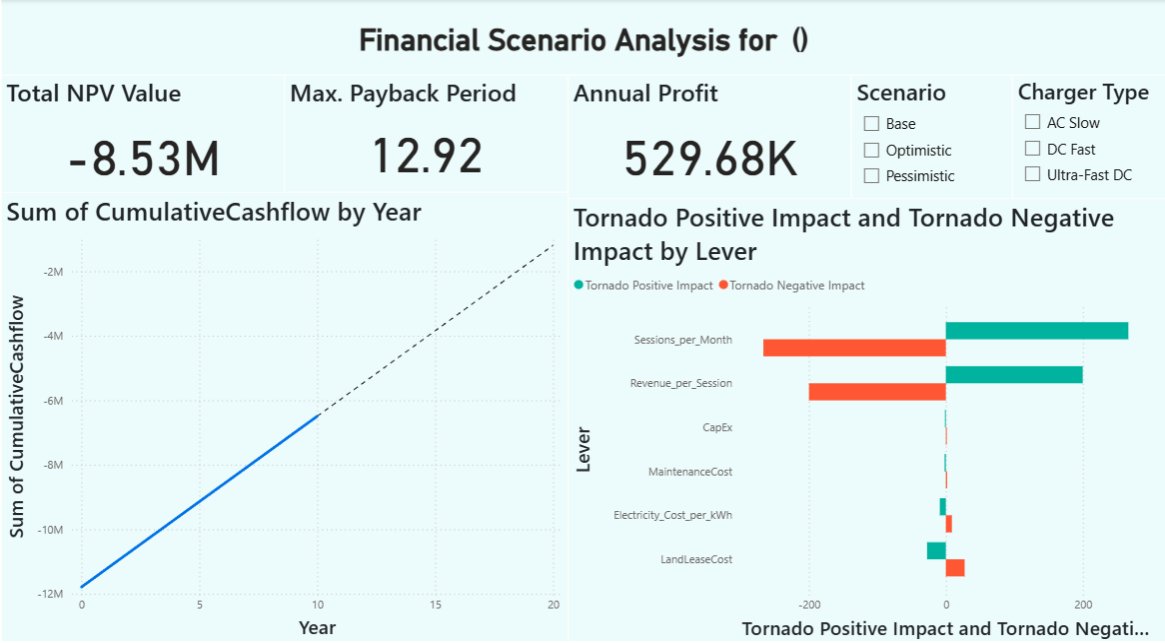

Fig. 5.2.

Breakeven Timeline in Phased Rollout

Wave	Months	Chargers Installed	Approx. CapEx (₹ Cr)	Expected Utilization (%)	Portfolio Payback (yrs)	Cumulative EBITDA Positive By
1 – Metro & Fleet	0–12	200	35–40	45–55%	3.4	Month 30
2 – Tier 2/3 + NH	13–24	350	55–60	50–60%	3.1	Month 40

3 – Nationwide	25–36	500	75–80	55–65%	3.2	Month 50

Table 5.2.

Key Strategic Levers to Improve Returns

1. **Maximize sessions/chg/day** via fleet MoUs & loyalty programs.
2. **CapEx optimization** via PPP, franchise or OEM-bundled installations.
3. **Tariff yield management** through ToD dynamic pricing.
4. **Renewable integration** to offset OPEX and improve ESG score.
5. **Phased scaling** to align CapEx spend with proven demand.

6. Risk Assessment & Defensibility

Our risk framework evaluates Financial, Technological, Market, and Policy factors, each scored by Likelihood (1–5) and Impact (1–5) to generate a Risk Score (max = 25).
High-priority risks are those scoring ≥16, which demand immediate mitigation action.

Key Risk Categories & Top Risks

Category	Risk	Risk Score	Impact	Likelihood	Mitigation Strategy
Financial	High OPEX in urban leases	20	Severe	Likely	Negotiate long-term leases; explore semi-urban sites with lower fixed cost.
Technological	Charger downtime & reliability issues	16	High	Moderate	Implement predictive maintenance; deploy redundancy at high-traffic sites.
Market	Slow EV adoption in Tier 2/3	18	High	High	Stagger rollout; focus on highway corridors & fleet hubs first.
Policy	Delays in power grid approvals	17	High	High	Engage with DISCOMs early; secure pre-approved sites; leverage policy incentives.
Financial	Tariff volatility affecting per-session	16	Medium	High	Introduce dynamic pricing; long-term

	margins				electricity contracts.

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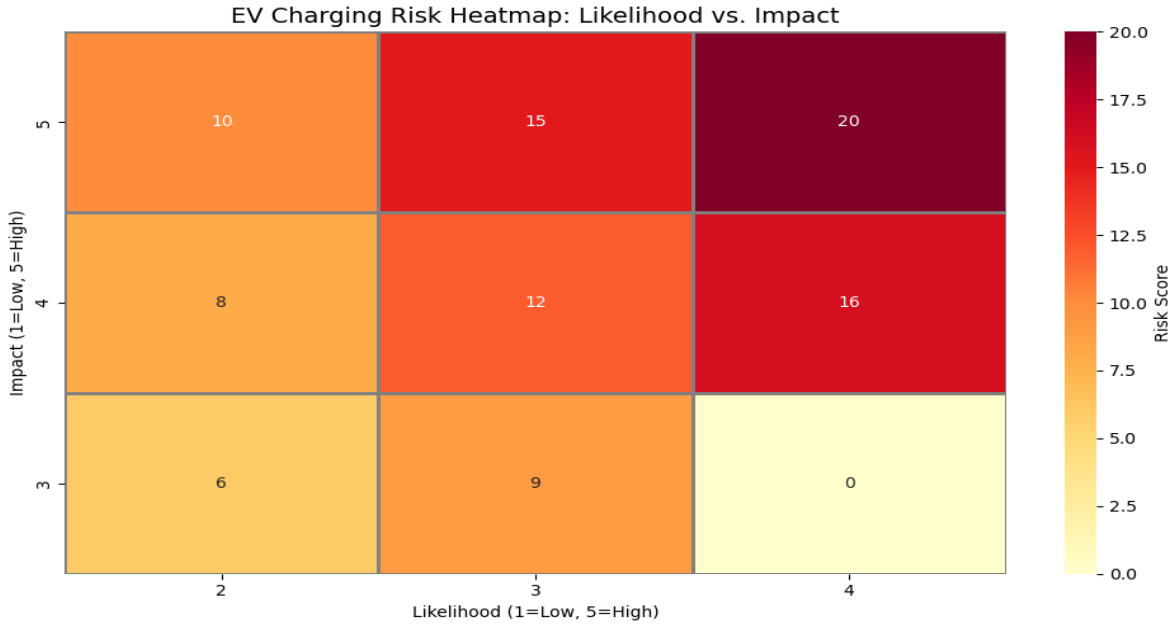

Fig. 6.1.

Mitigation Framework

- **Proactive Cost Management:** Target lease-to-revenue ratio below **15%** in early years.
- **Tech Reliability:** Deploy **IoT monitoring & AI predictive analytics** to reduce unplanned downtime.
- **Demand Risk Diversification:** Mix urban, highway, and fleet-heavy nodes in portfolio.
- **Policy Engagement:** Maintain active participation in **state EV policy forums** to anticipate regulatory changes.
- **Energy Cost Stability:** Hedge electricity costs with bulk procurement and off-peak charging incentives.

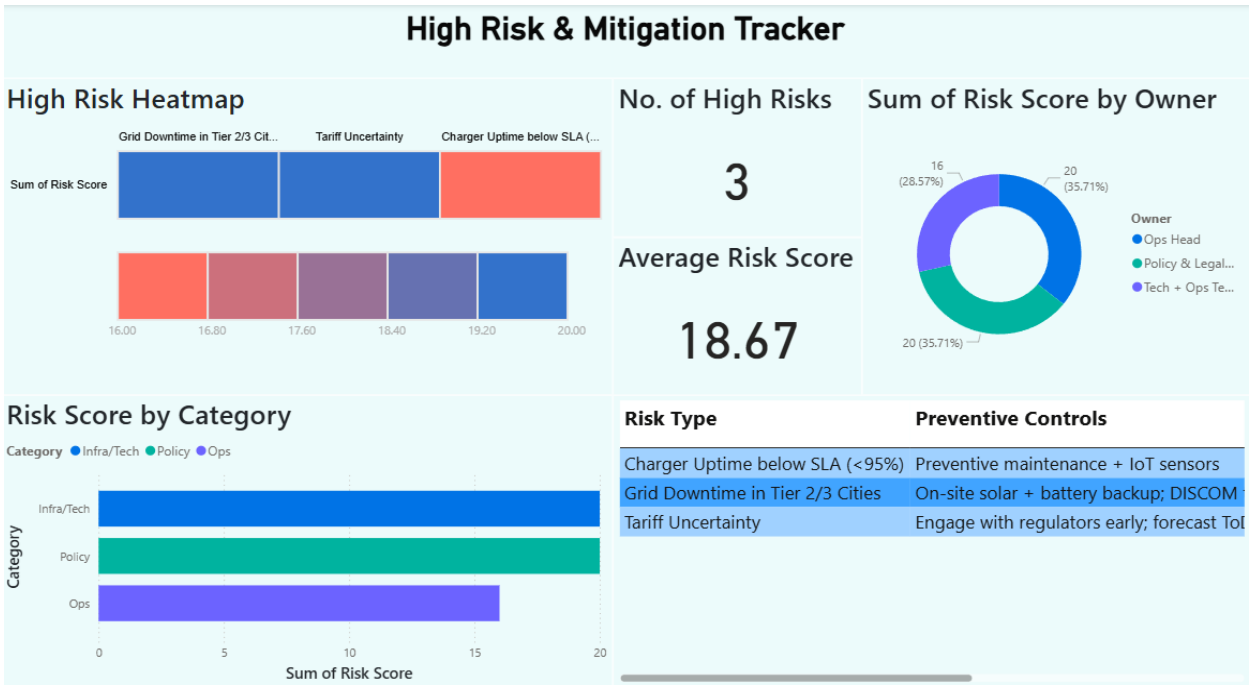

Fig. 6.2.

Defensibility Scorecard Highlights

(Scale: 1–5, where 5 = Strong moat)

Moat Factor	Score	Strategic Edge
Network Scale	4.5	Pan-India presence incl. Tier 2/3 and highways
Technology IP	4.0	Proprietary AI-driven load management & maintenance tools
Customer Lock-in	4.0	Loyalty programs + subscription bundles
Partnership Ecosystem	4.5	Auto OEMs, real estate developers, energy utilities
Cost Advantage	3.5	Renewable integration and optimised OPEX

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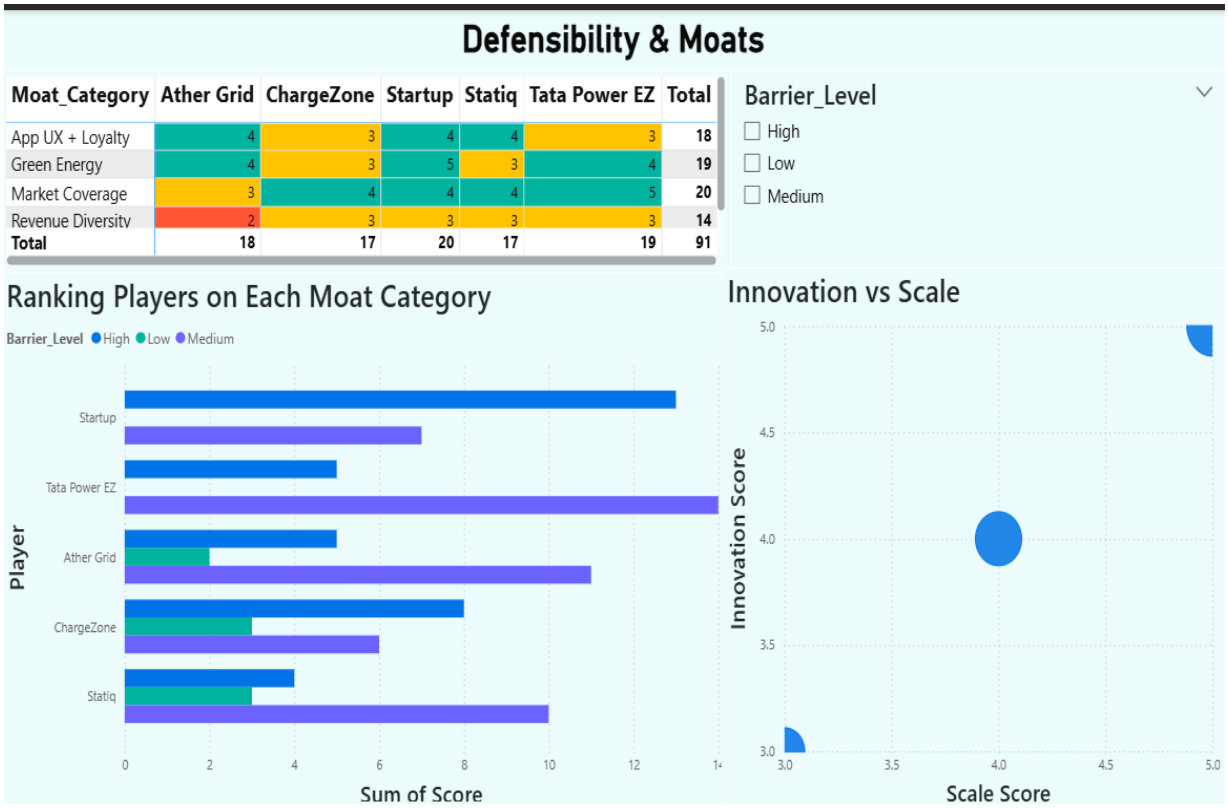


Fig. 6.3.

7. Conclusion & Strategic Recommendations

Our phased analysis confirms that India's EV charging infrastructure market offers multi-billion INR potential, but profitability hinges on targeted rollout, cost discipline, and strategic partnerships. The following actions are recommended for senior leadership consideration:

1. Launch as a Scaling Player with Phased Rollout

- **Phase 1 (0–18 months):** Focus on metros, national highways, and select fleet-heavy Tier 2 hubs.
- **Phase 2 (18–36 months):** Expand to Tier 3 cities, leveraging franchise models to reduce CapEx exposure

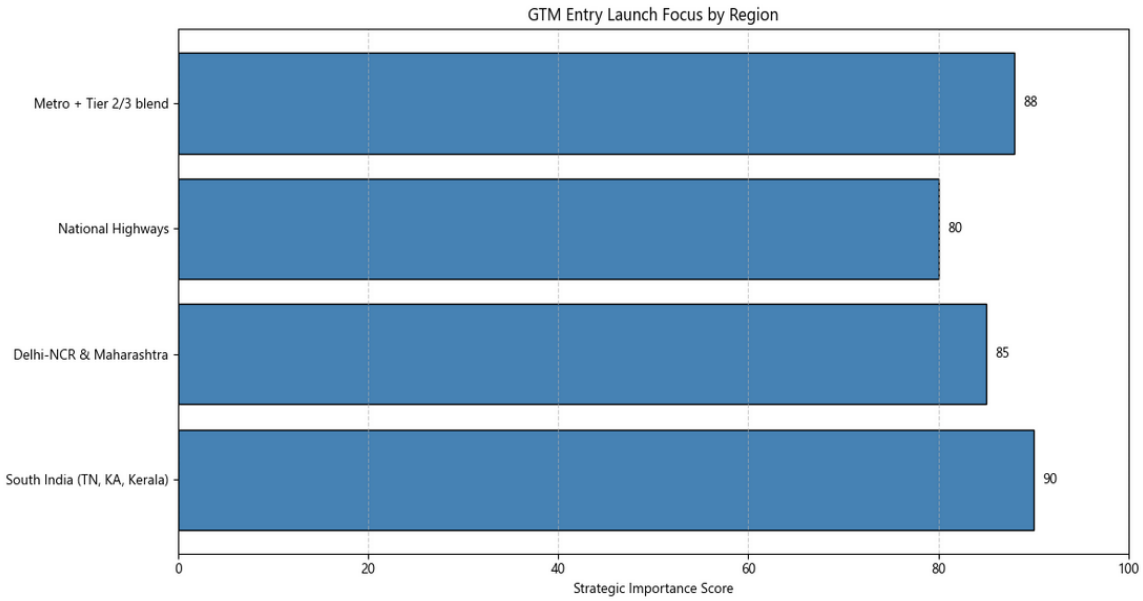


Fig 7.1.

2. Build a Differentiated Brand with Technology Edge

- Integrate AI-driven predictive maintenance and IoT-enabled smart load management across network.
- Offer real-time app booking, dynamic pricing, and loyalty programs to boost retention.

3. Secure Strategic Partnerships Early

- Collaborate with auto OEMs, fleet operators, real estate developers, and DISCOMs for exclusive site access.
- Align with renewable energy providers for green branding and lower operational costs.

4. Balance Infra Mix for ROI Optimization

- Maintain a **60:40 ratio** between DC fast/ultra-fast chargers and AC slow/fast units for optimal utilisation and payback.
- Deploy **ultra-fast chargers** on high-traffic corridors; **AC units** for residential, office, and captive fleet use

5. Adopt Proactive Risk Management

- Implement financial stress-testing quarterly to evaluate tariff volatility, utilisation dips, and cost spikes.
- Build a policy watch team to pre-empt grid approval delays and incentive shifts.

6. Maintain Defensibility through Scale & Ecosystem

- Achieve critical mass in charger density before competitors saturate target corridors.
- Develop a partner-locked ecosystem that raises switching costs for B2B clients and fleets.

7. Execute Measured Pricing & Revenue Models

- Use time-of-day tariffs to shift demand to off-peak hours, reducing strain on the grid and OPEX.
- Introduce subscription and bundled charging plans for fleets to stabilise revenue streams.

8. Monitor & Iterate

- Use Power BI live dashboards to track utilisation, uptime, revenue, and customer feedback.
- Feed real-world operational data into scenario models to refine deployment strategy every 6–12 months.

Appendix A: Python Scripts & Analysis Outputs

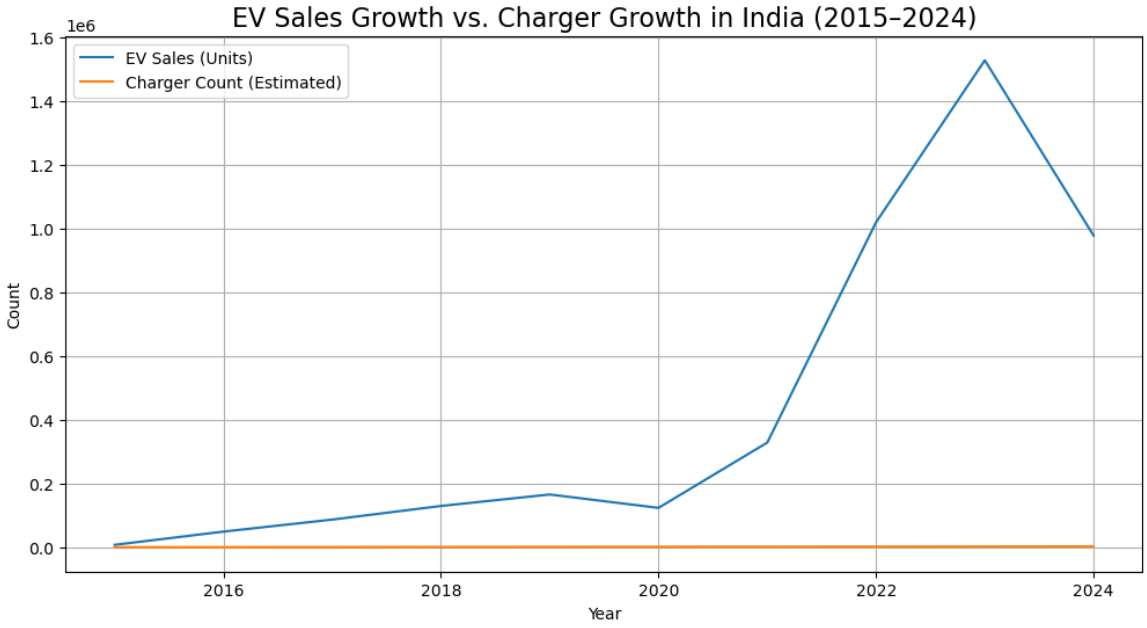


Fig. A.1.

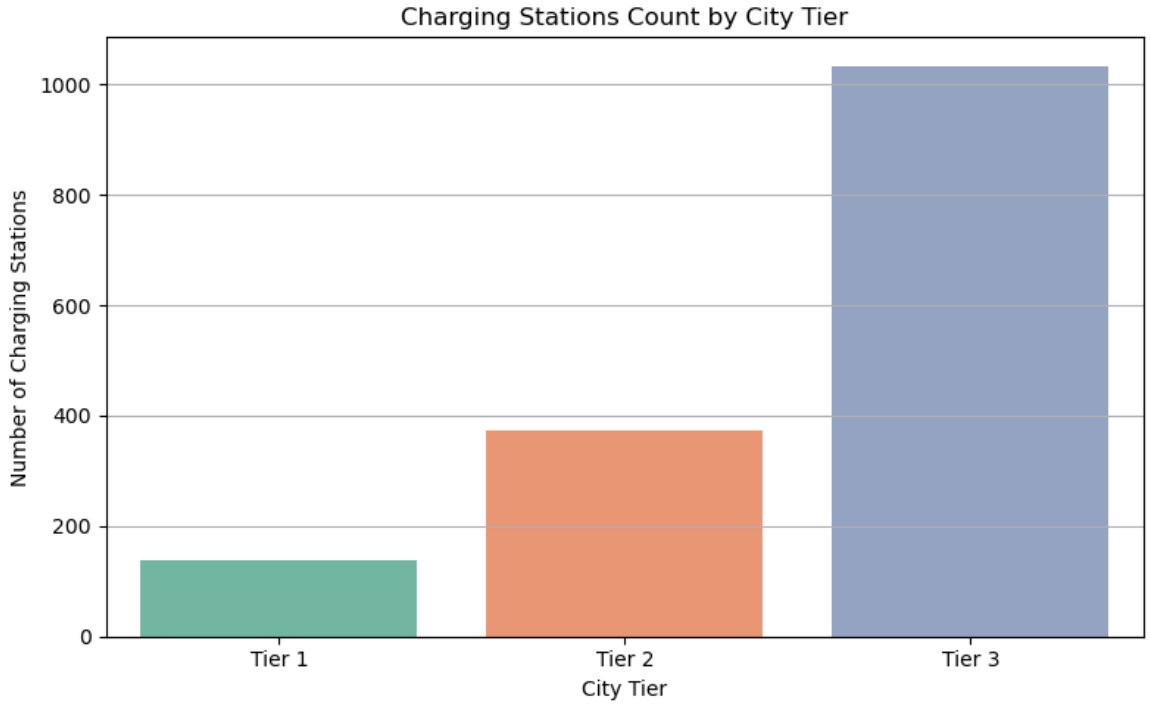

Charging Stations Count by City Tier
Number of Charging Stations
0
200
400
600
800
1000
Tier 1
Tier 2
Tier 3
City Tier

Fig. A.2.

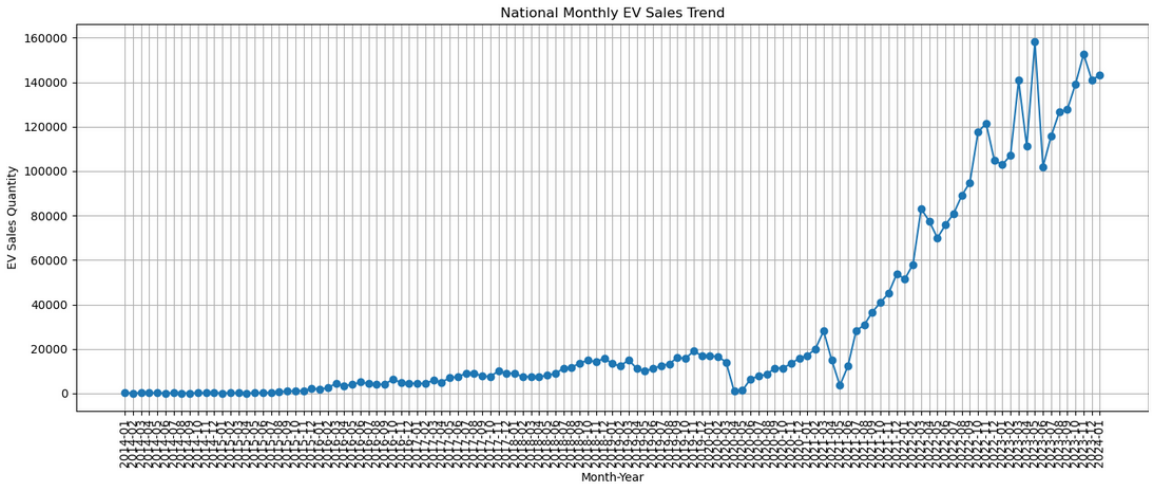

National Monthly EV Sales Trend
EV Sales Quantity
0
20000
40000
60000
80000
100000
120000
140000
160000
Month-Year

Fig. A.3

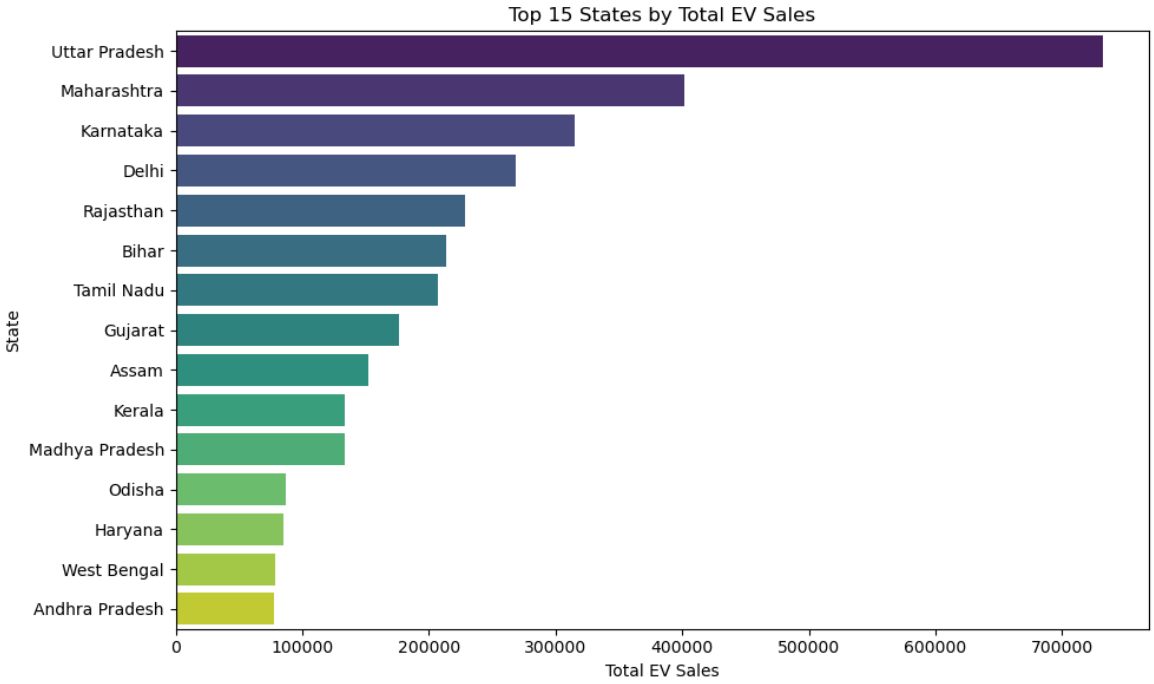

Top 15 States by Total EV Sales
Uttar Pradesh
Maharashtra
Karnataka
Delhi
Rajasthan
Bihar
Tamil Nadu
Gujarat
Assam
Kerala
Madhya Pradesh
Odisha
Haryana
West Bengal
Andhra Pradesh
State
0
100000
200000
300000
400000
500000
600000
700000
Total EV Sales

Fig. A.4

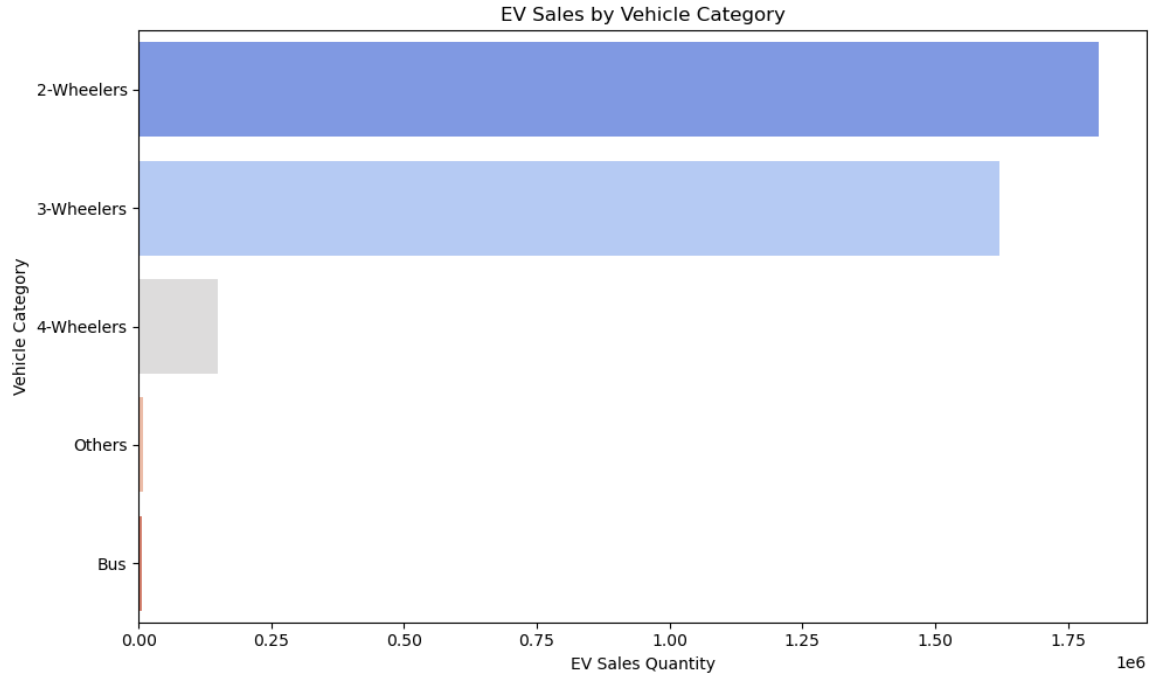

EV Sales by Vehicle Category
2-Wheelers
3-Wheelers
4-Wheelers
Others
Bus
Vehicle Category
0.00
0.25
0.50
0.75
1.00
1.25
1.50
1.75
1e6
EV Sales Quantity

Fig. A.5

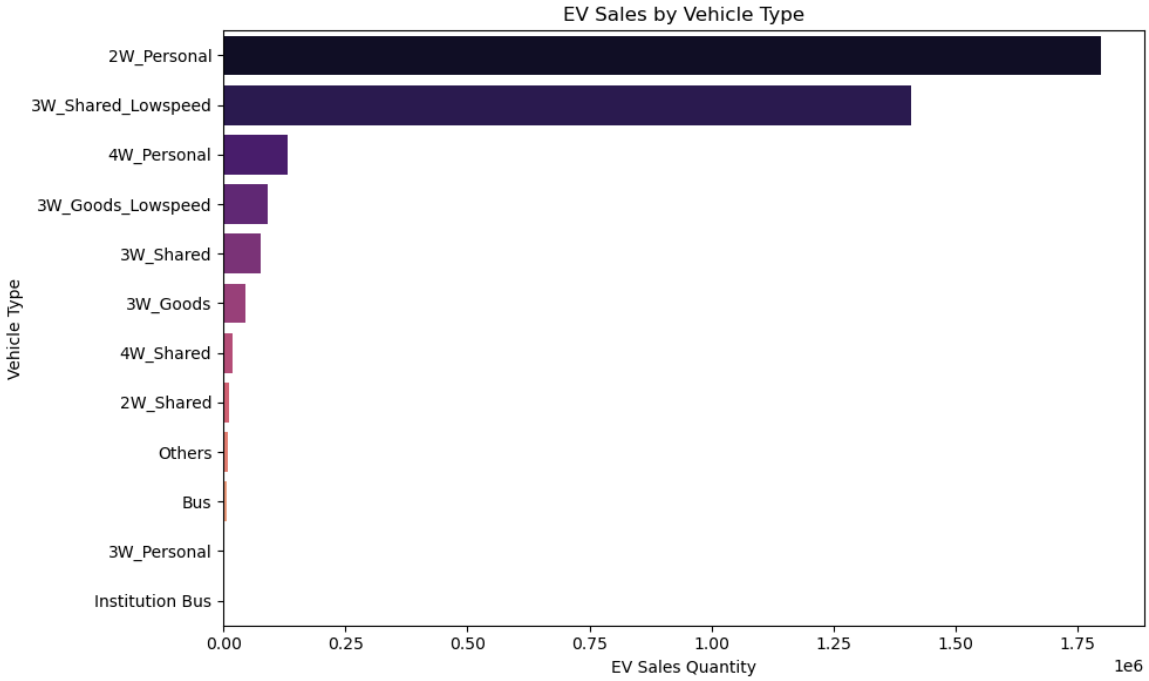

EV Sales by Vehicle Type
2W_Personal
3W_Shared_Lowspeed
4W_Personal
3W_Goods_Lowspeed
3W_Shared
3W_Goods
4W_Shared
2W_Shared
Others
Bus
3W_Personal
Institution Bus
Vehicle Type
0.00
0.25
0.50
0.75
1.00
1.25
1.50
1.75
1e6
EV Sales Quantity

Fig. A.6

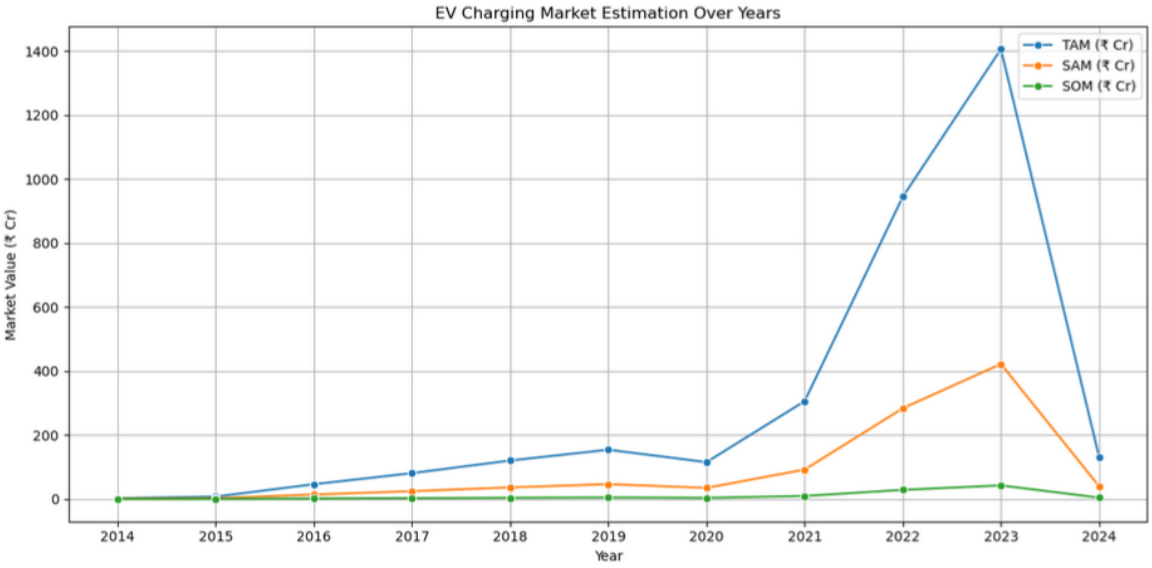

EV Charging Market Estimation Over Years
TAM (₹ Cr)
SAM (₹ Cr)
SOM (₹ Cr)
Market Value (₹ Cr)
0
200
400
600
800
1000
1200
1400
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
Year

Fig. A.7.

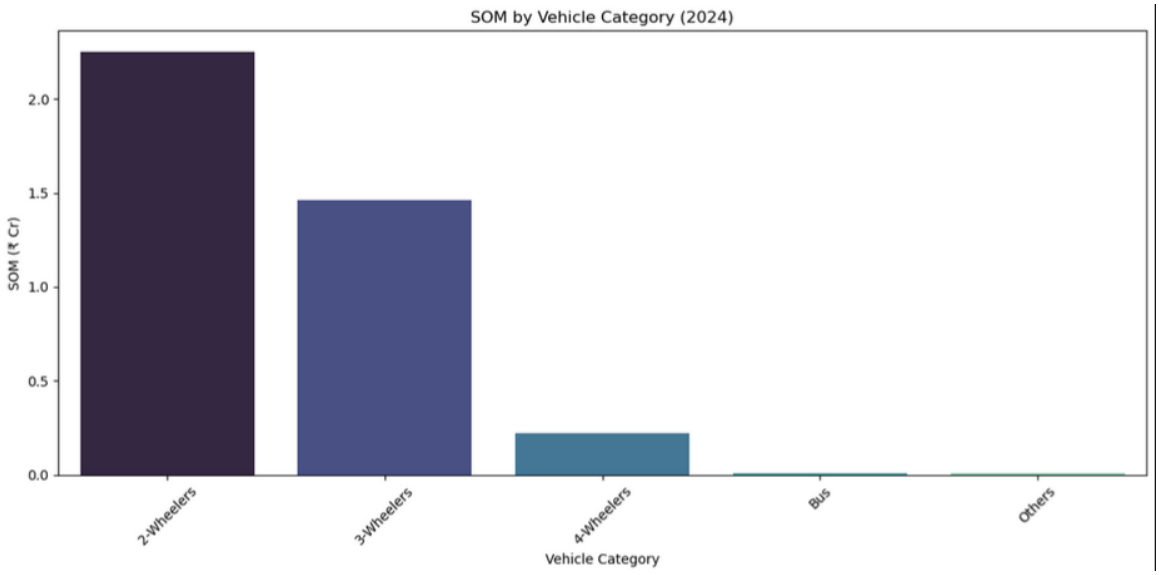

SOM by Vehicle Category (2024)
SOM (₹ Cr)
2.0
1.5
1.0
0.5
0.0
2-Wheelers
3-Wheelers
4-Wheelers
Bus
Others
Vehicle Category

Fig. A.8.

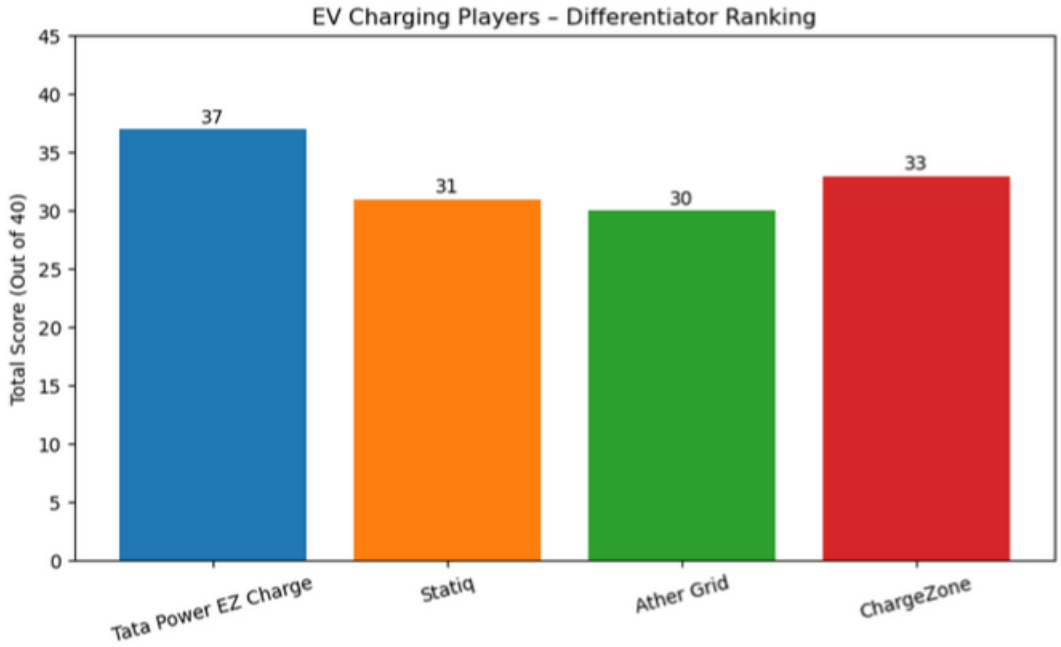

EV Charging Players – Differentiator Ranking
Total Score (Out of 40)
45
40
35
30
25
20
15
10
5
0
37
31
30
33
Tata Power EZ Charge
Statiq
Ather Grid
ChargeZone

Fig. A.9.

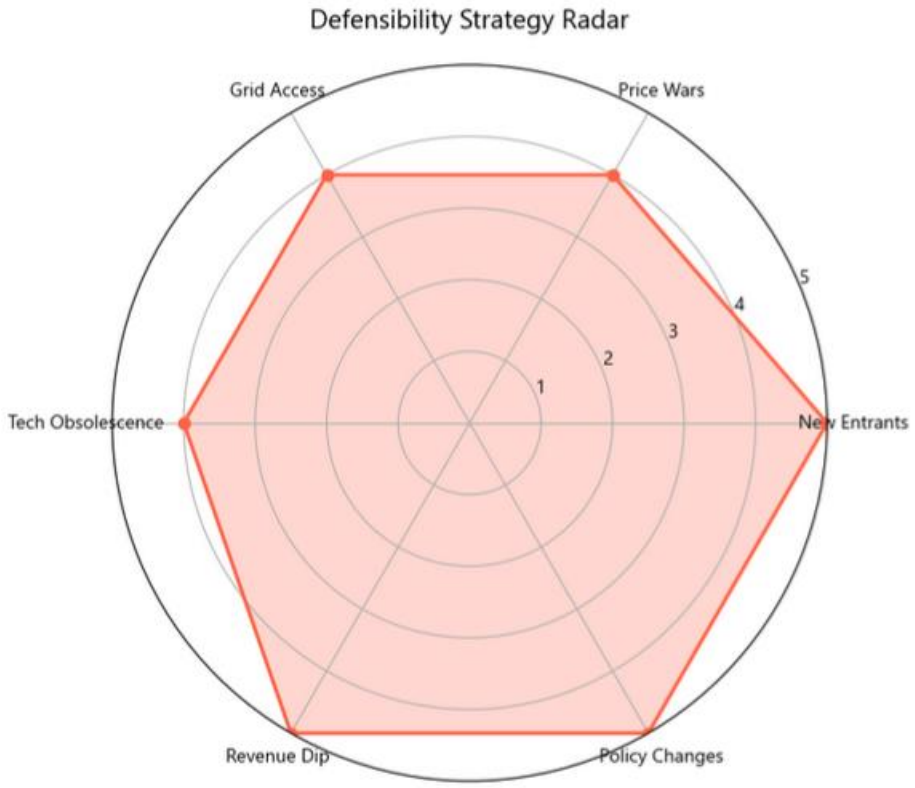


Fig. A.10.

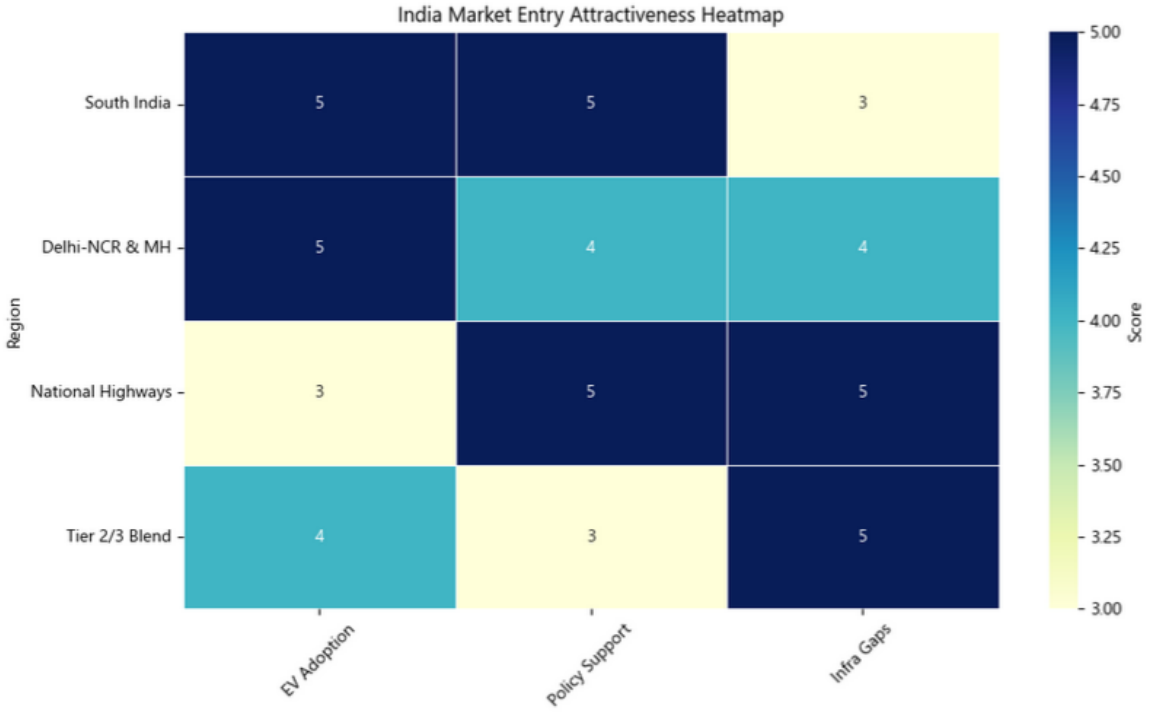


Fig. A.11.

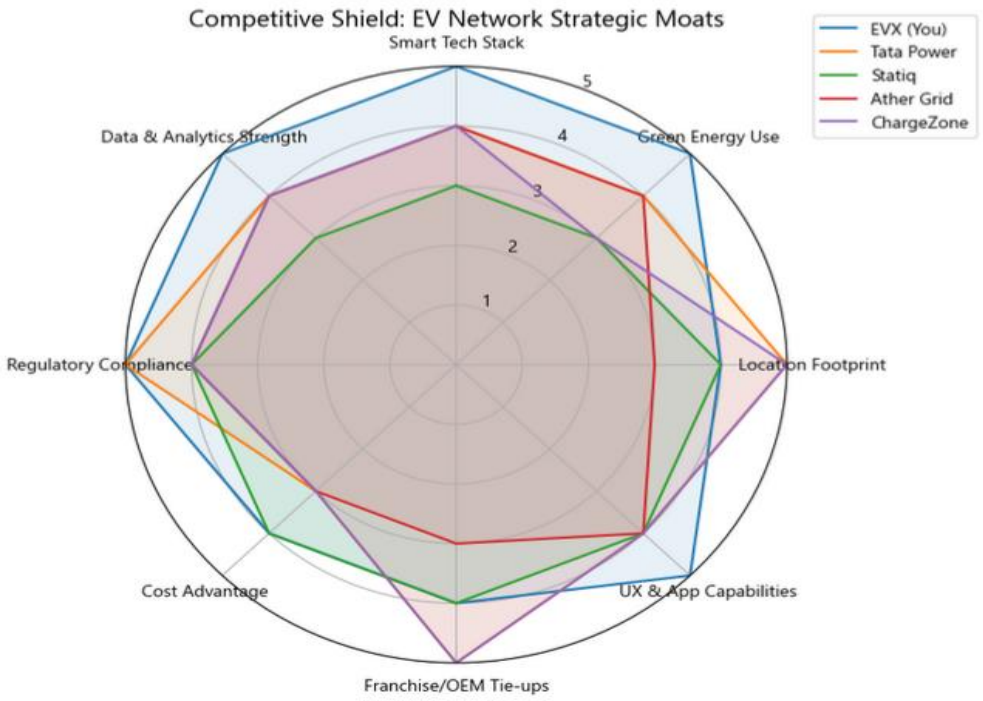


Fig. A.12.

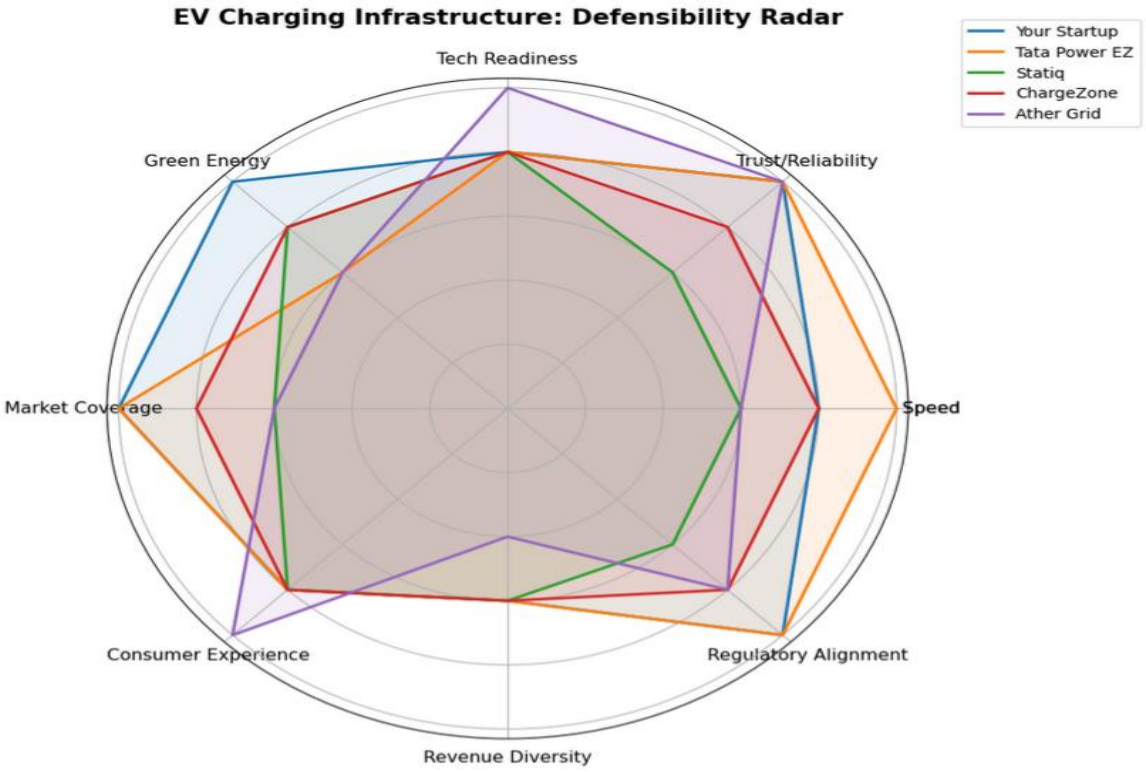


Fig. A.13.

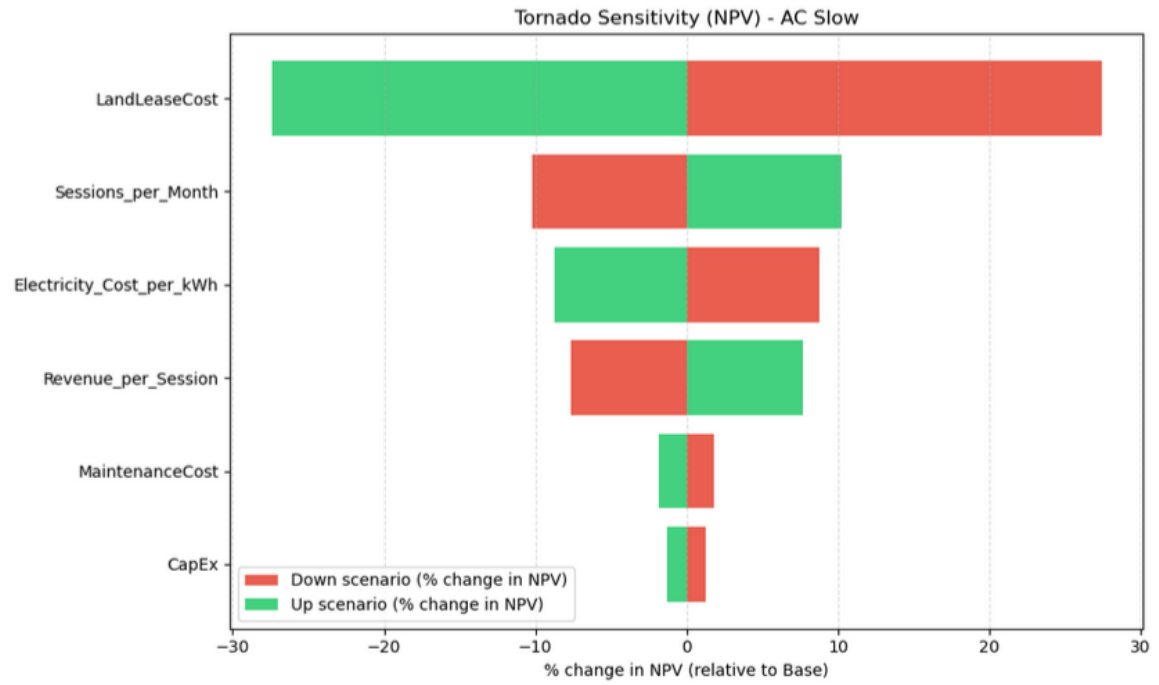


Fig. A.14.

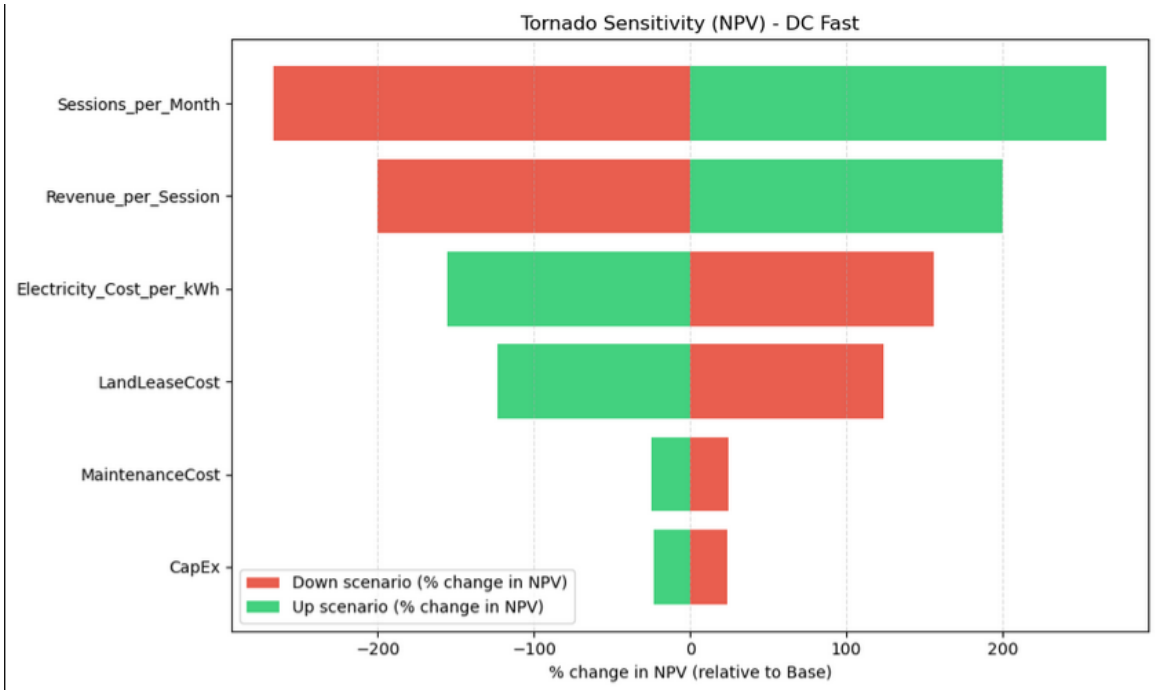


Fig. A.15.

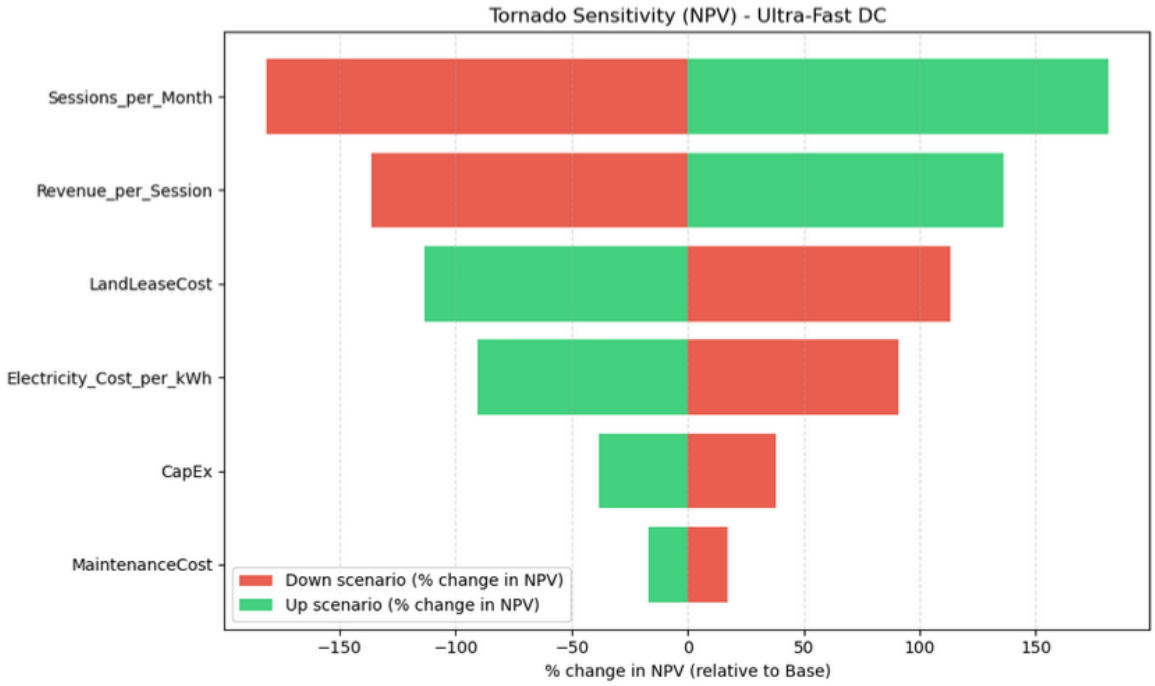


Fig. A.16.

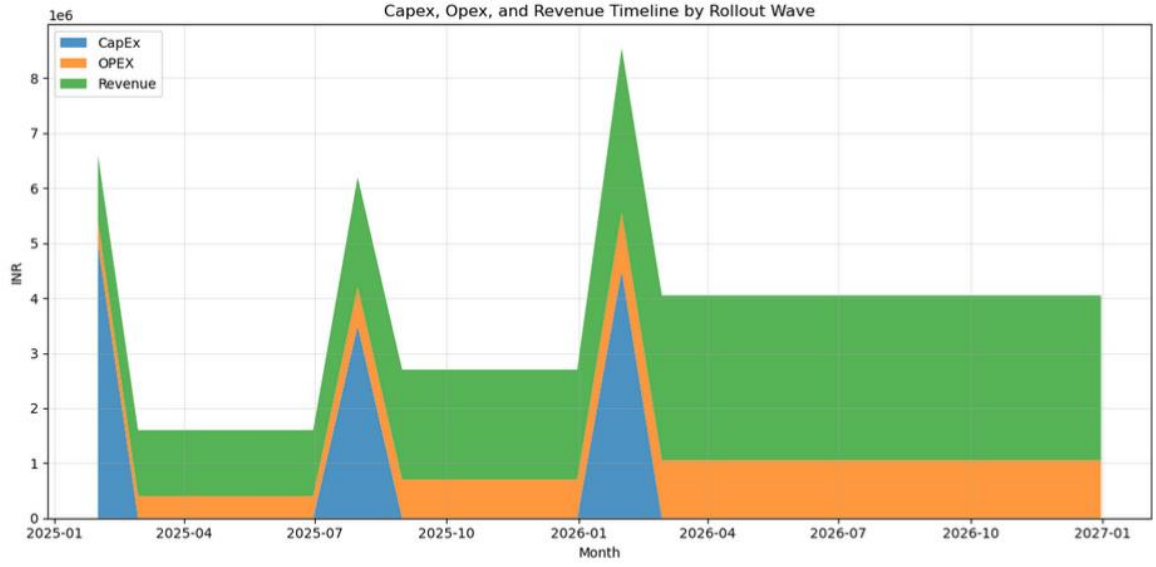


Fig. A.17.

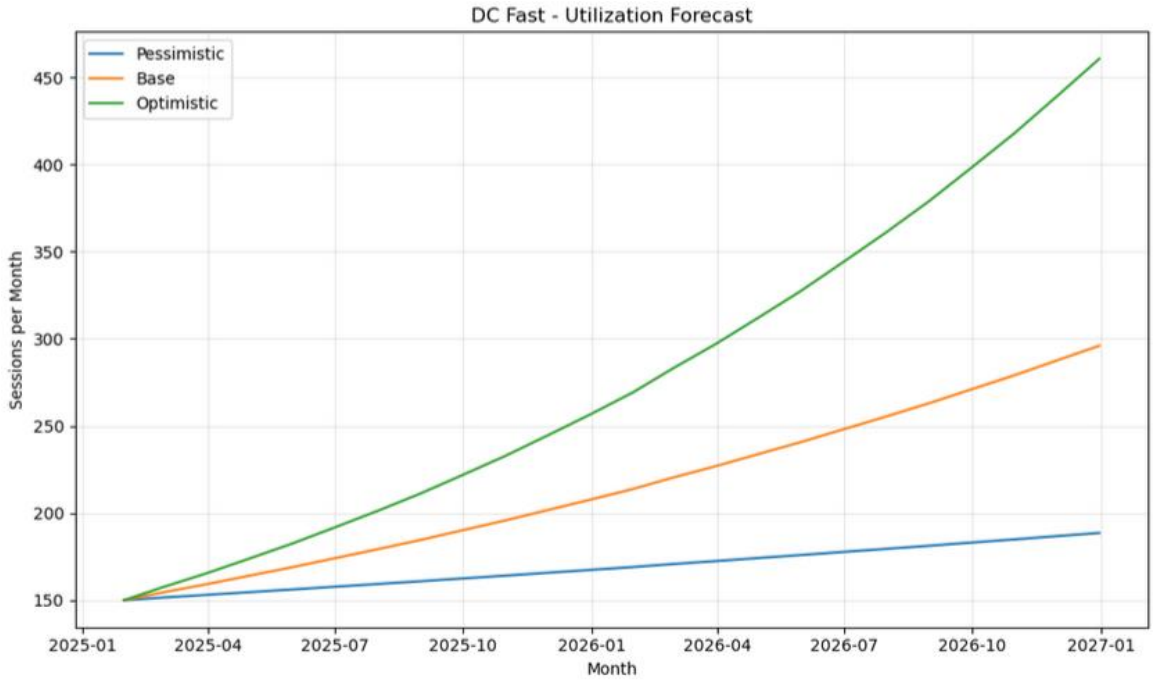


Fig. A.18.

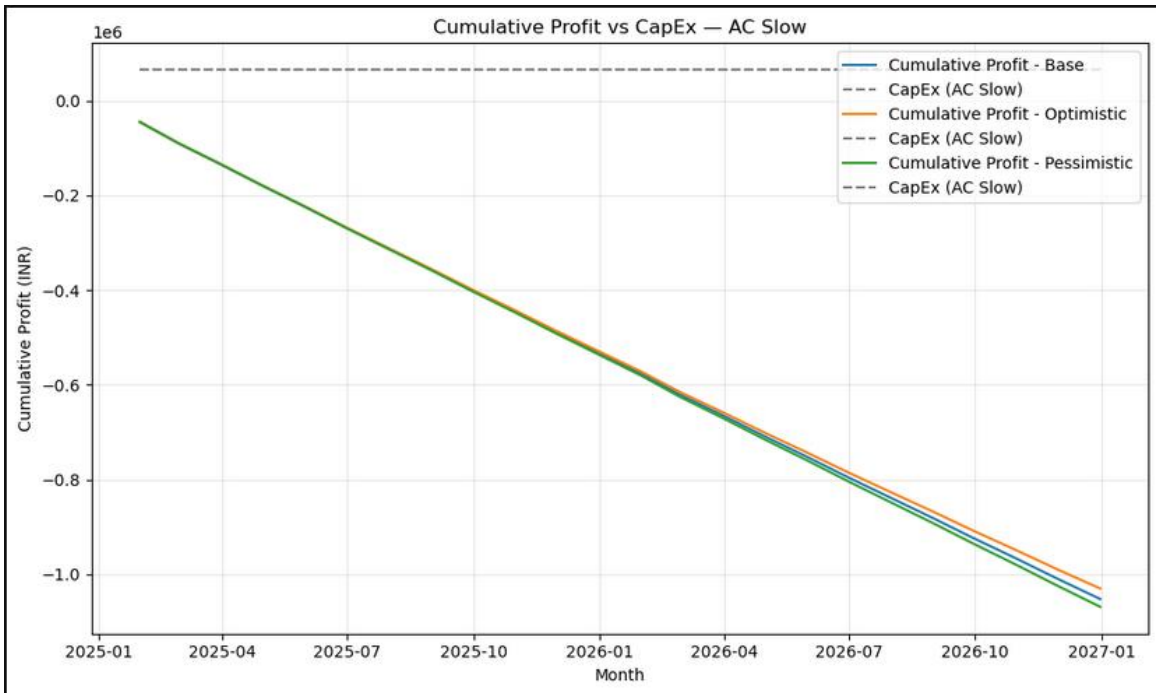


Fig. A.19.

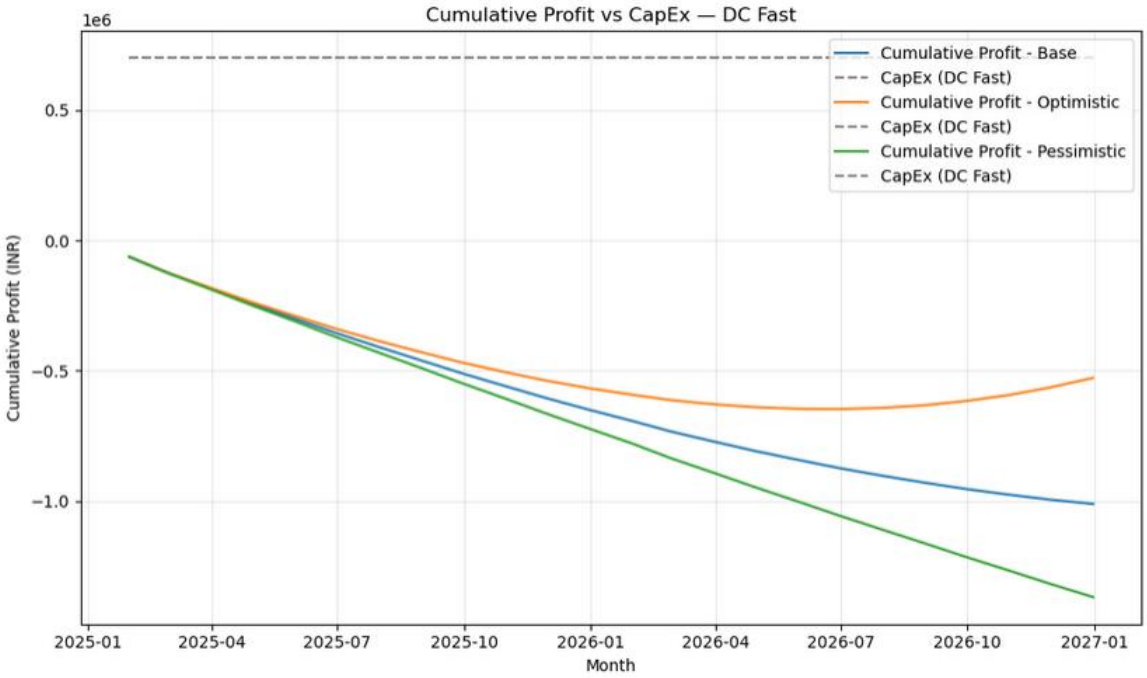


Fig. A.20.

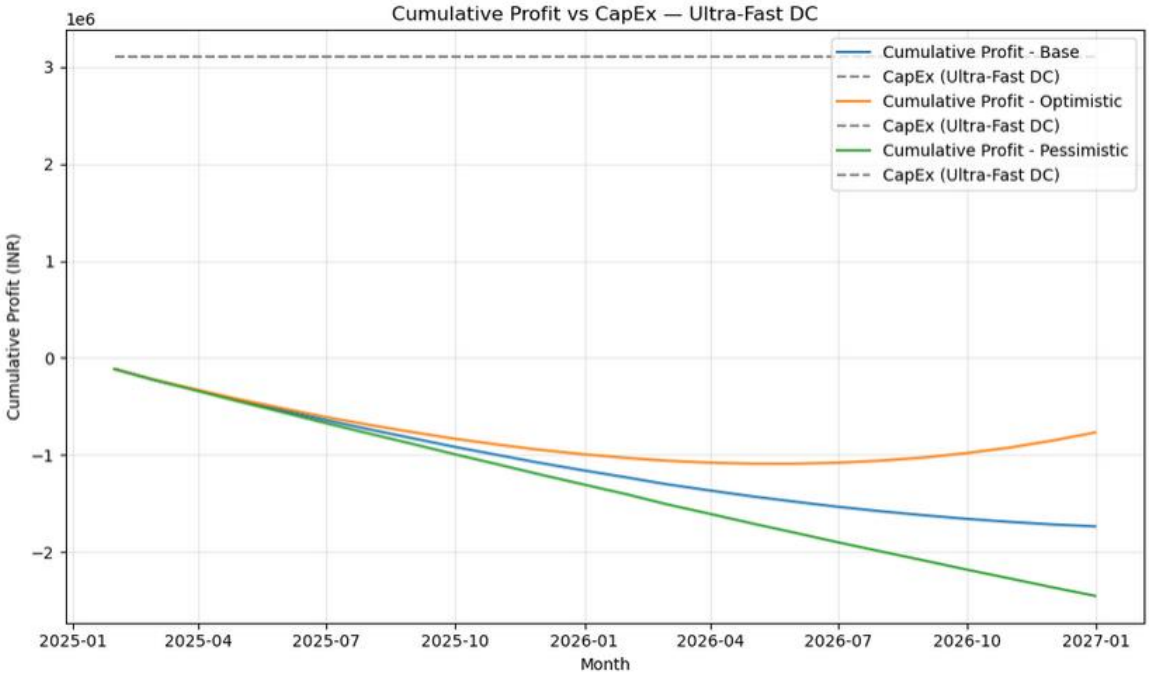


Fig. A.21.

Appendix B: Power BI Dashboard Mockups & DAX measures

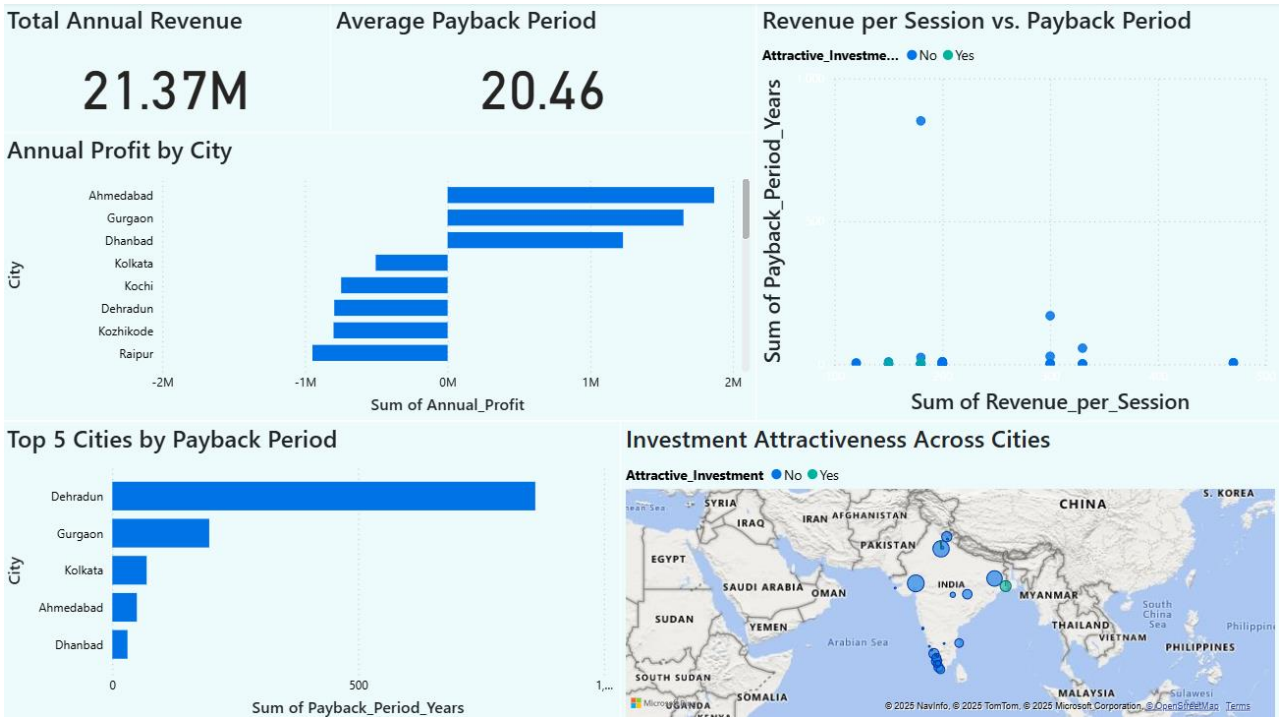


Fig. B. 1.

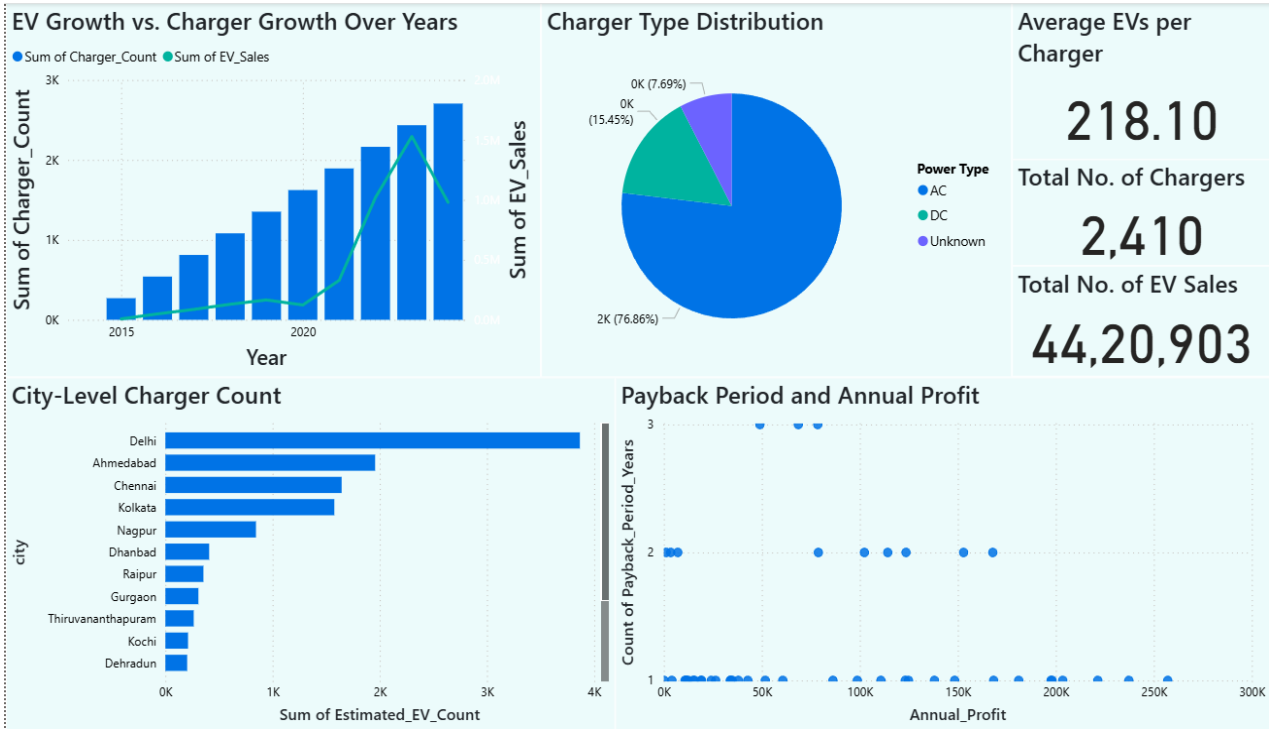


Fig. B.2

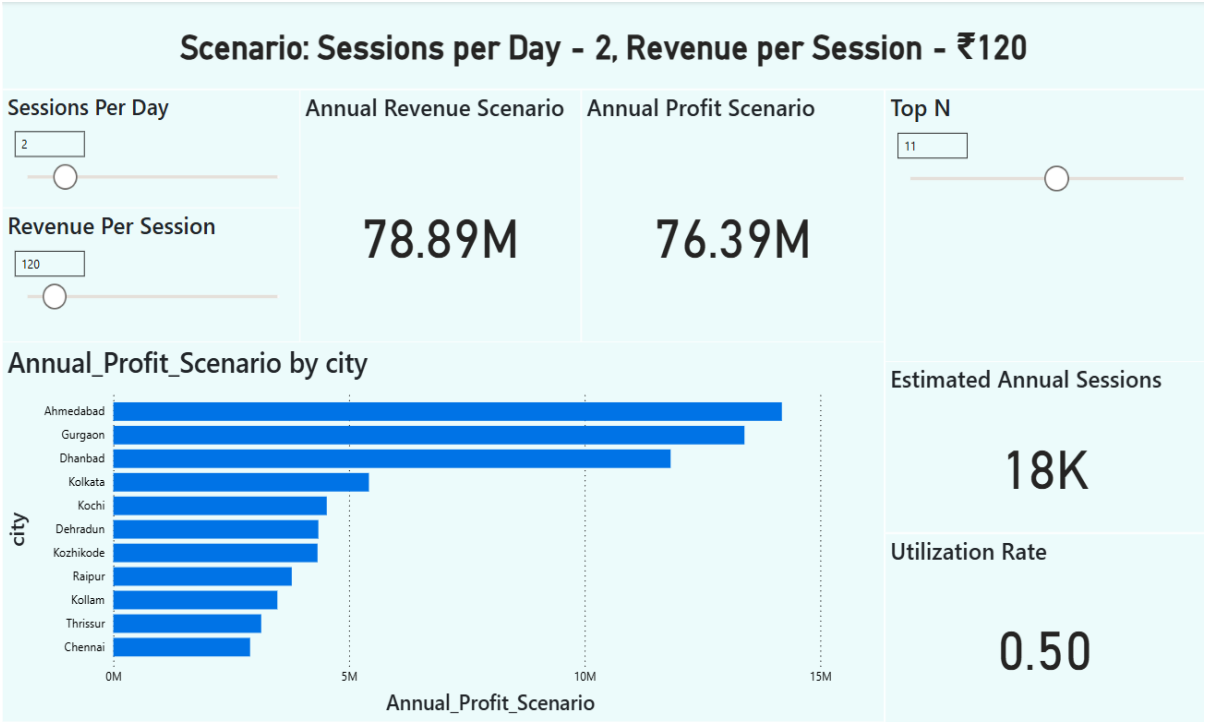

Scenario: Sessions per Day - 2, Revenue per Session - ₹120
Sessions Per Day
2
Revenue Per Session
120
Annual Revenue Scenario
78.89M
Annual Profit Scenario
76.39M
Top N
11
Annual_Profit_Scenario by city
Ahmedabad
Gurgaon
Dhanbad
Kolkata
Kochi
Dehradun
Kozhikode
Raipur
Kollam
Thrissur
Chennai
city
0M
5M
10M
15M
Annual_Profit_Scenario
Estimated Annual Sessions
18K
Utilization Rate
0.50

Fig. B.3.

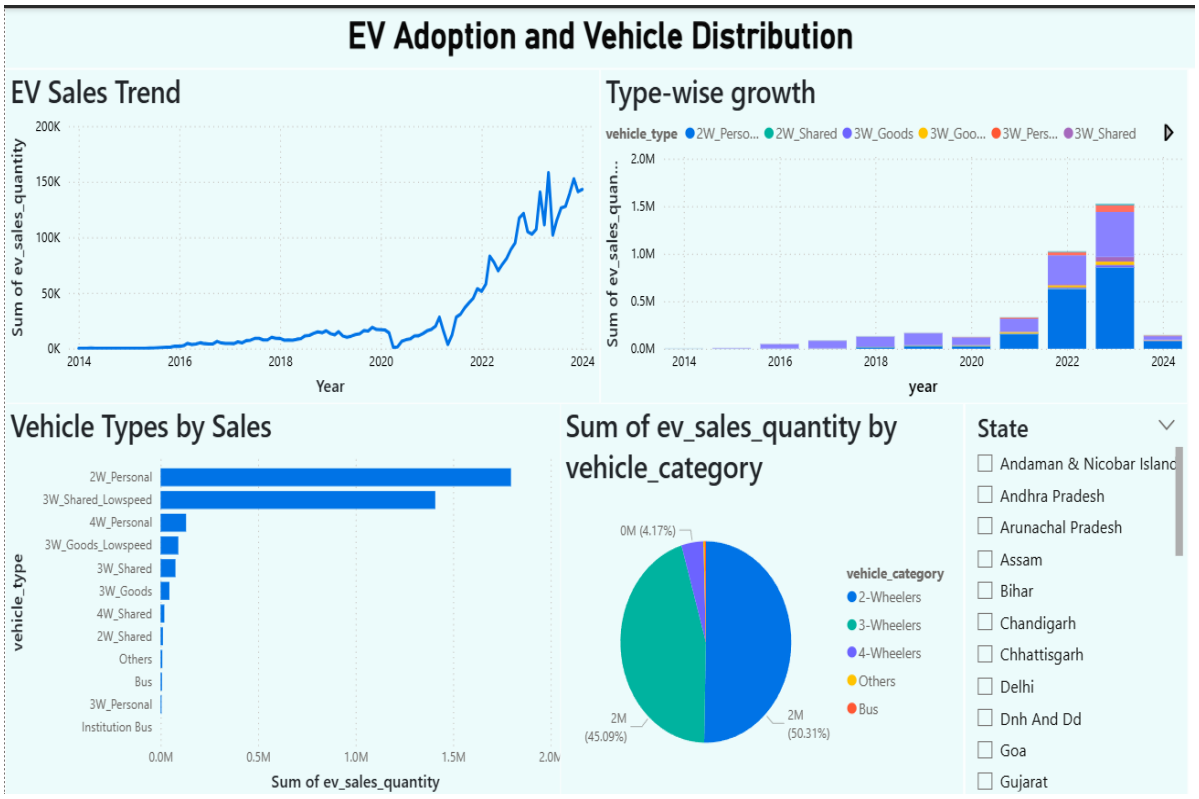

EV Adoption and Vehicle Distribution
EV Sales Trend
Sum of ev_sales_quantity
200K
150K
100K
50K
0K
2014
2016
2018
2020
2022
2024
Year
Type-wise growth
vehicle_type
2W_Perso...
2W_Shared
3W_Goods
3W_Goo...
3W_Pers...
3W_Shared
Sum of ev_sales_quan...
2.0M
1.5M
1.0M
0.5M
0.0M
year
Vehicle Types by Sales
2W_Personal
3W_Shared_Lowspeed
4W_Personal
3W_Goods_Lowspeed
3W_Shared
3W_Goods
4W_Shared
2W_Shared
Others
Bus
3W_Personal
Institution Bus
vehicle_type
0.0M
0.5M
1.0M
1.5M
2.0M
Sum of ev_sales_quantity
Sum of ev_sales_quantity by vehicle_category
0M (4.17%)
2M
(45.09%)
2M
(50.31%)
vehicle_category
2-Wheelers
3-Wheelers
4-Wheelers
Others
Bus
State
Andaman & Nicobar Island
Andhra Pradesh
Arunachal Pradesh
Assam
Bihar
Chandigarh
Chhattisgarh
Delhi
Dnh And Dd
Goa
Gujarat

Fig. B.4.

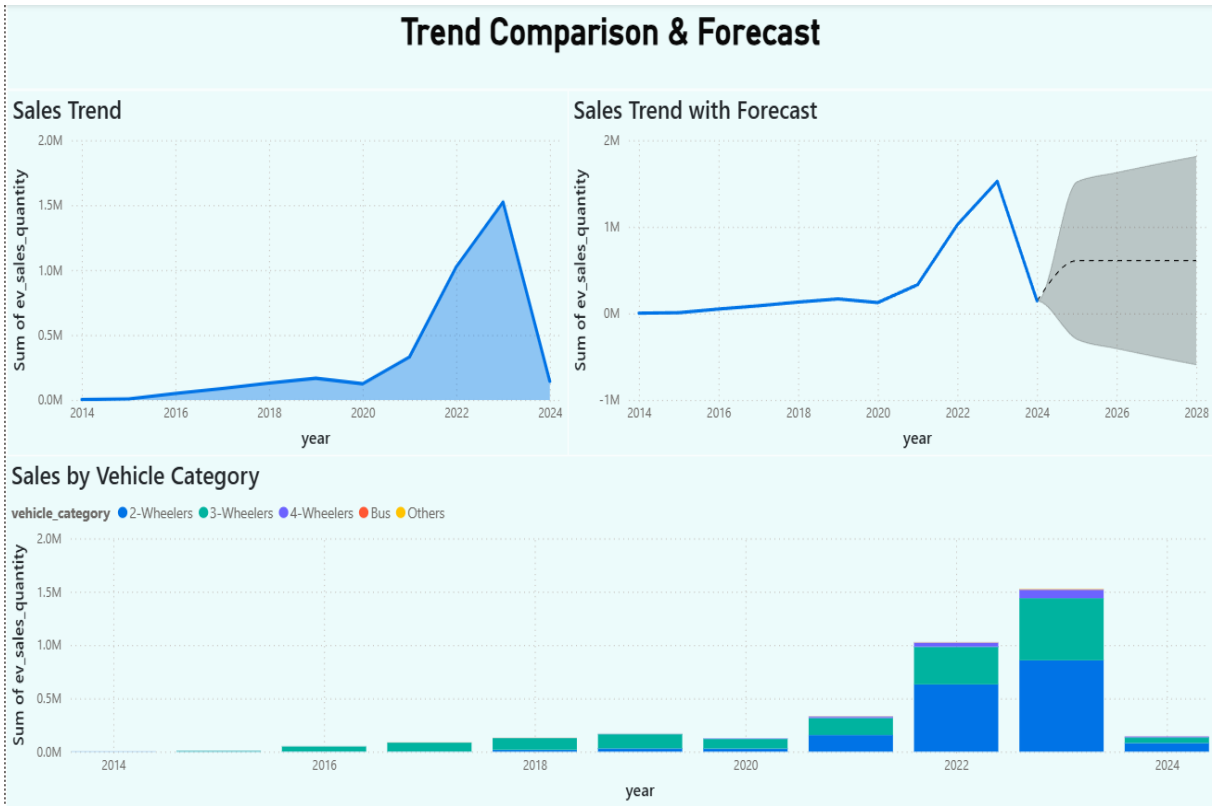

Trend Comparison & Forecast
Sales Trend
Sum of ev_sales_quantity
year
Sales Trend with Forecast
Sum of ev_sales_quantity
year
Sales by Vehicle Category
vehicle_category 2-Wheelers 3-Wheelers 4-Wheelers Bus Others
Sum of ev_sales_quantity
year

Fig. B.5.

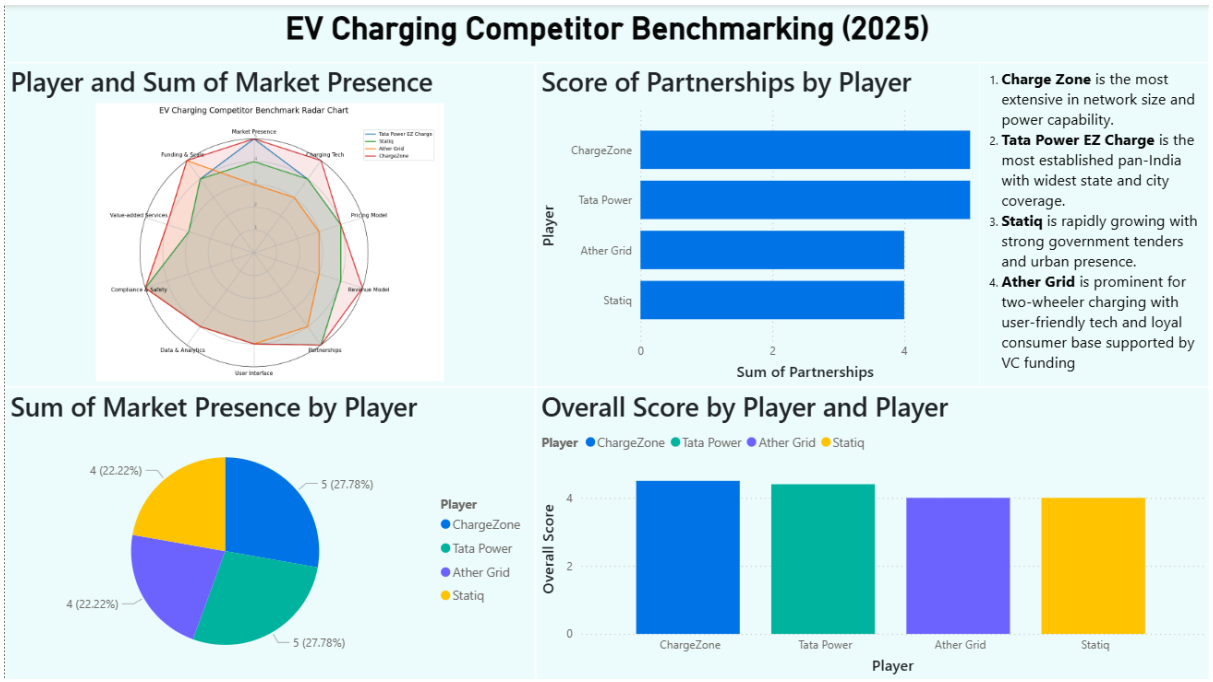

EV Charging Competitor Benchmarking (2025)
Player and Sum of Market Presence
EV Charging Competitor Benchmark Radar Chart
Score of Partnerships by Player
ChargeZone
Tata Power
Ather Grid
Statiq
Player
Sum of Partnerships
1. Charge Zone is the most extensive in network size and power capability.
2. Tata Power EZ Charge is the most established pan-India with widest state and city coverage.
3. Statiq is rapidly growing with strong government tenders and urban presence.
4. Ather Grid is prominent for two-wheeler charging with user-friendly tech and loyal consumer base supported by VC funding
Sum of Market Presence by Player
4 (22.22%)
5 (27.78%)
4 (22.22%)
5 (27.78%)
Player
ChargeZone
Tata Power
Ather Grid
Statiq
Overall Score by Player and Player
Player ChargeZone Tata Power Ather Grid Statiq
Overall Score
ChargeZone
Tata Power
Ather Grid
Statiq
Player

Fig. B.6.

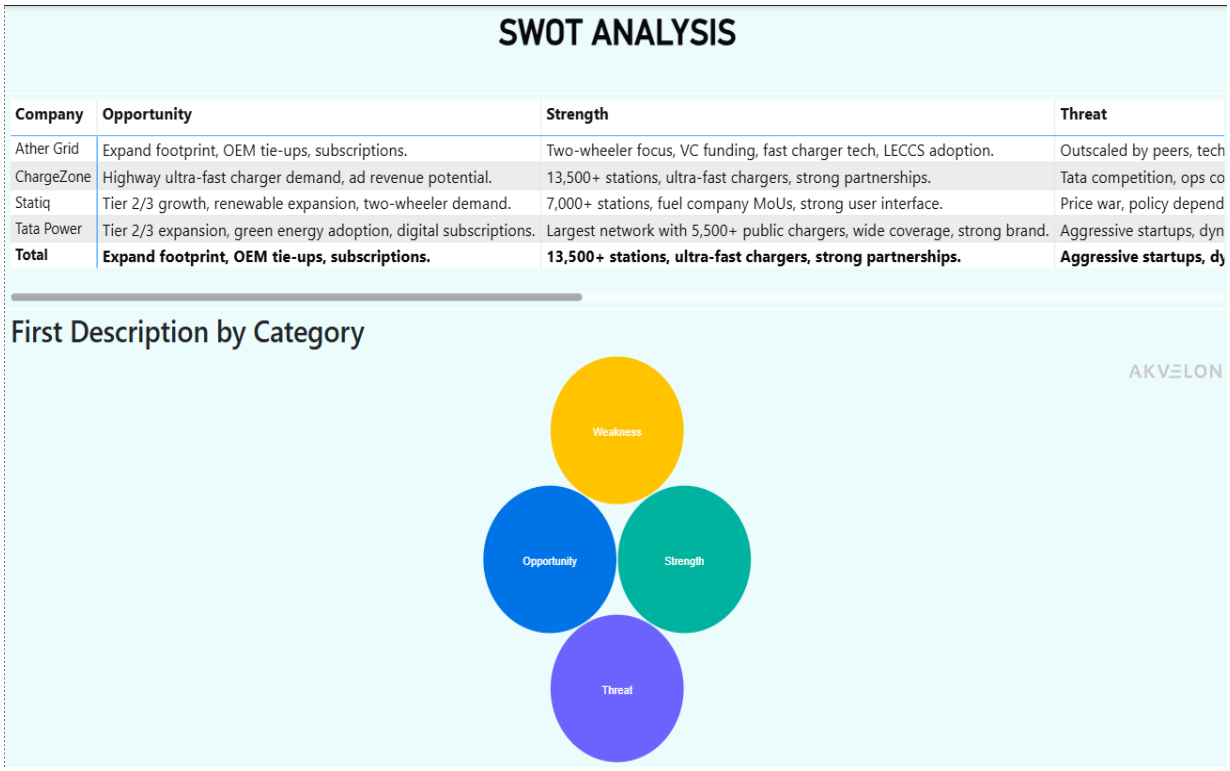

SWOT ANALYSIS
Company | Opportunity | Strength | Threat
Ather Grid | Expand footprint, OEM tie-ups, subscriptions. | Two-wheeler focus, VC funding, fast charger tech, LECCS adoption. | Outscaled by peers, tech
ChargeZone | Highway ultra-fast charger demand, ad revenue potential. | 13,500+ stations, ultra-fast chargers, strong partnerships. | Tata competition, ops co
Statiq | Tier 2/3 growth, renewable expansion, two-wheeler demand. | 7,000+ stations, fuel company MoUs, strong user interface. | Price war, policy depend
Tata Power | Tier 2/3 expansion, green energy adoption, digital subscriptions. | Largest network with 5,500+ public chargers, wide coverage, strong brand. | Aggressive startups, dyn
Total | Expand footprint, OEM tie-ups, subscriptions. | 13,500+ stations, ultra-fast chargers, strong partnerships. | Aggressive startups, dy
First Description by Category
AKVELON
Weakness
Opportunity
Strength
Threat

Fig.B.7.

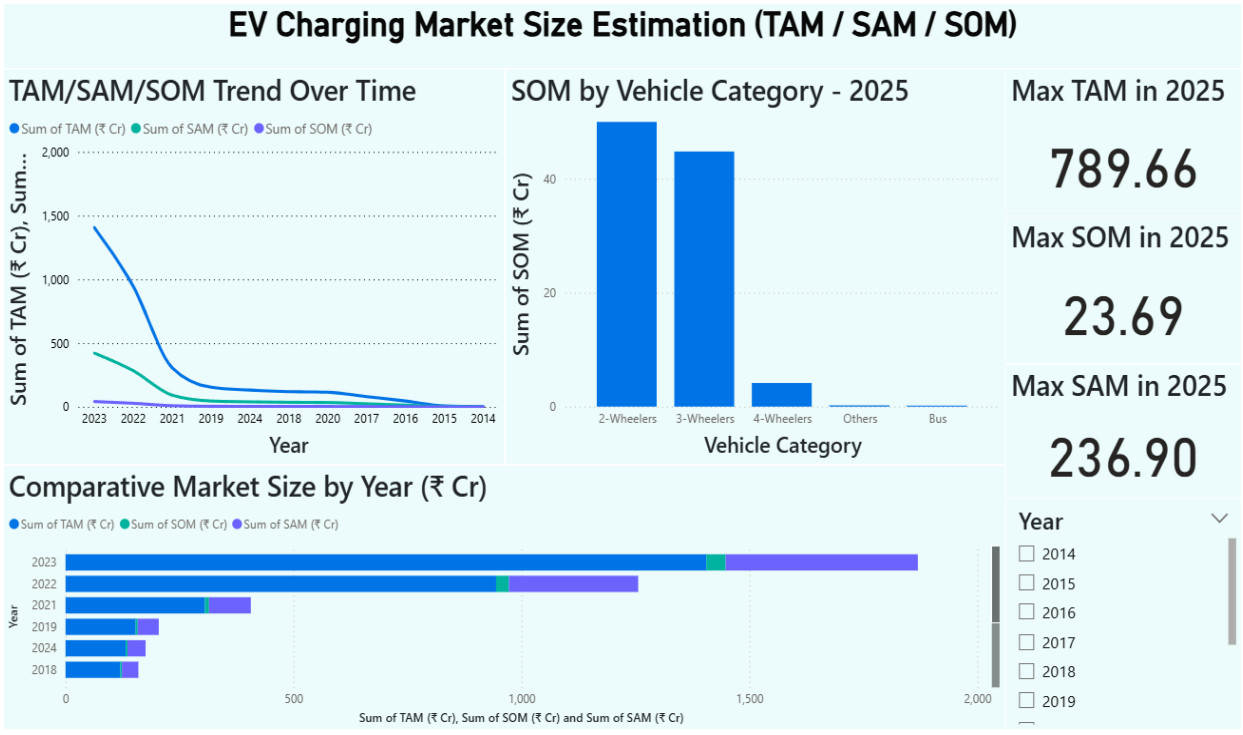

EV Charging Market Size Estimation (TAM / SAM / SOM)
TAM/SAM/SOM Trend Over Time
Sum of TAM (₹ Cr)
Sum of SAM (₹ Cr)
Sum of SOM (₹ Cr)
Sum of TAM (₹ Cr), Sum...
2,000
1,500
1,000
500
0
2023 2022 2021 2019 2024 2018 2020 2017 2016 2015 2014
Year
SOM by Vehicle Category - 2025
Sum of SOM (₹ Cr)
40
20
0
2-Wheelers
3-Wheelers
4-Wheelers
Others
Bus
Vehicle Category
Max TAM in 2025
789.66
Max SOM in 2025
23.69
Max SAM in 2025
236.90
Comparative Market Size by Year (₹ Cr)
Sum of TAM (₹ Cr)
Sum of SOM (₹ Cr)
Sum of SAM (₹ Cr)
Year
2023
2022
2021
2019
2024
2018
0
500
1,000
1,500
2,000
Sum of TAM (₹ Cr), Sum of SOM (₹ Cr) and Sum of SAM (₹ Cr)
Year
2014
2015
2016
2017
2018
2019

Fig. B.8.

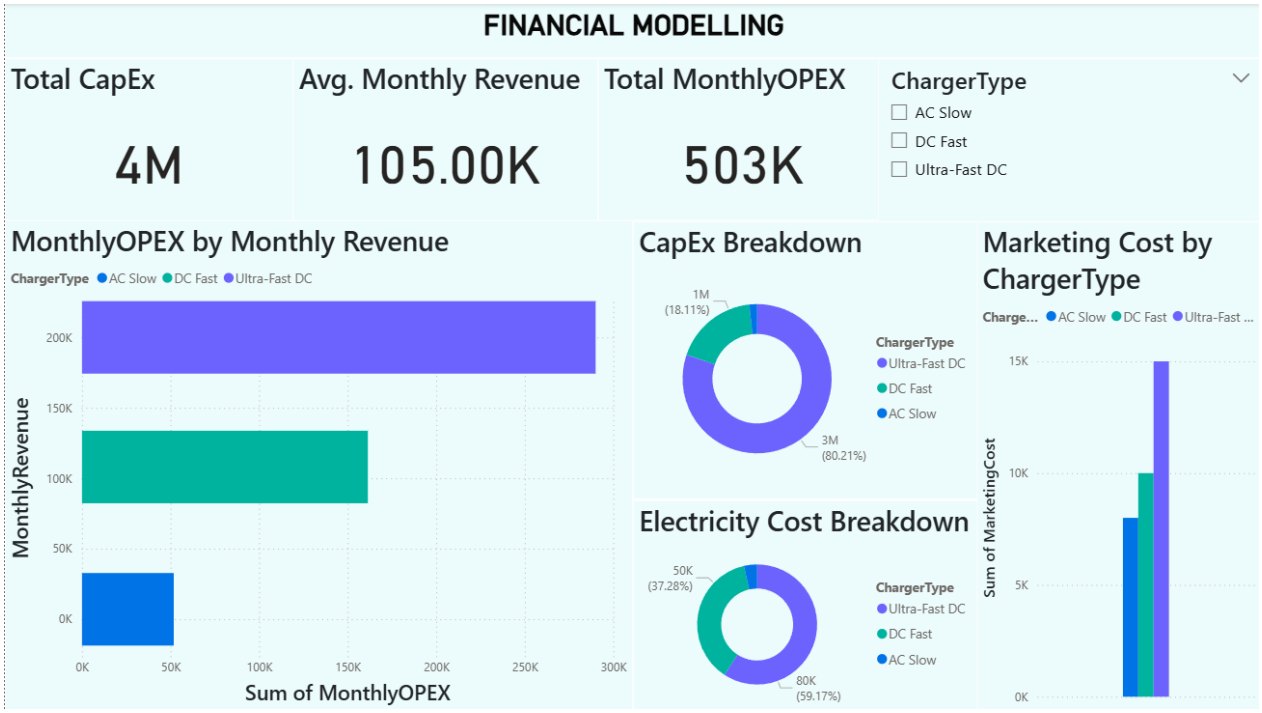


Fig. B.9.

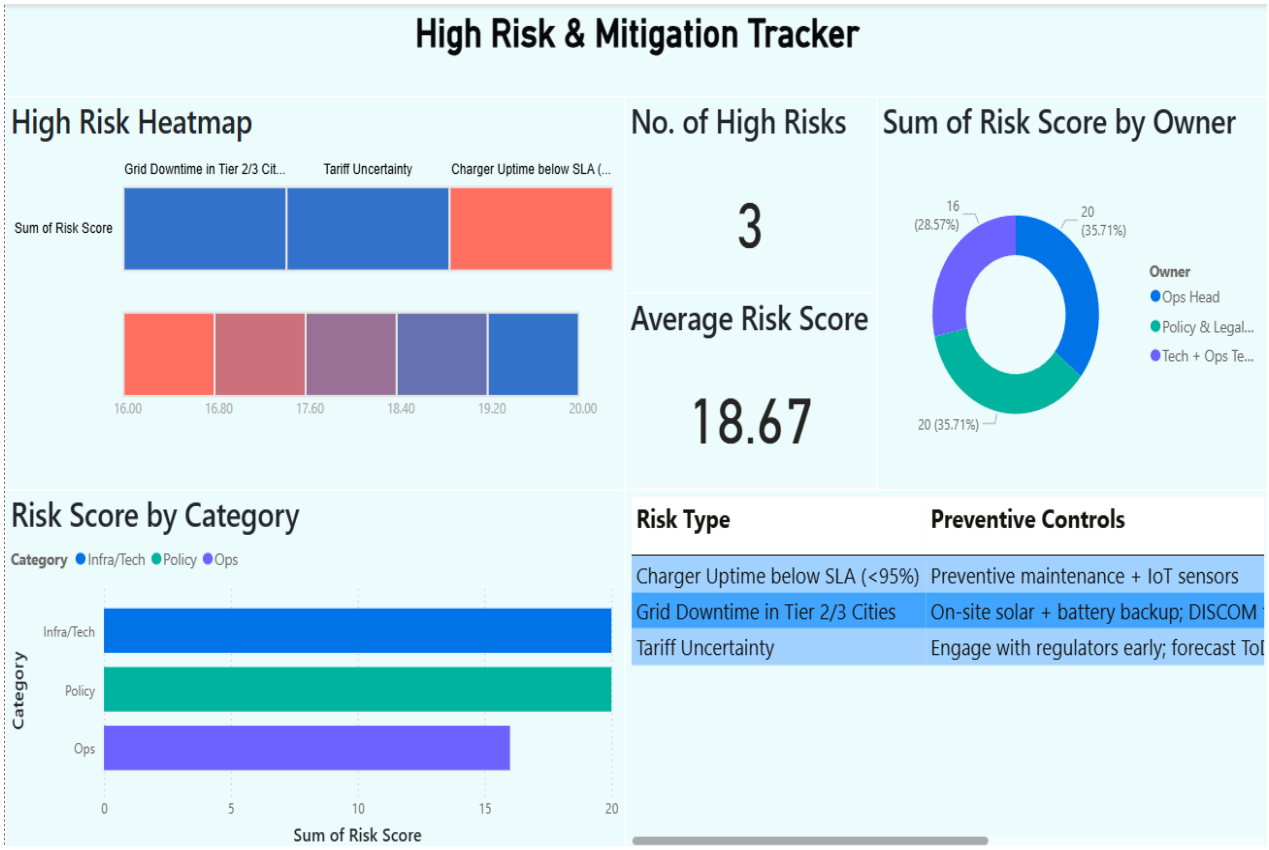


Fig. B.10.

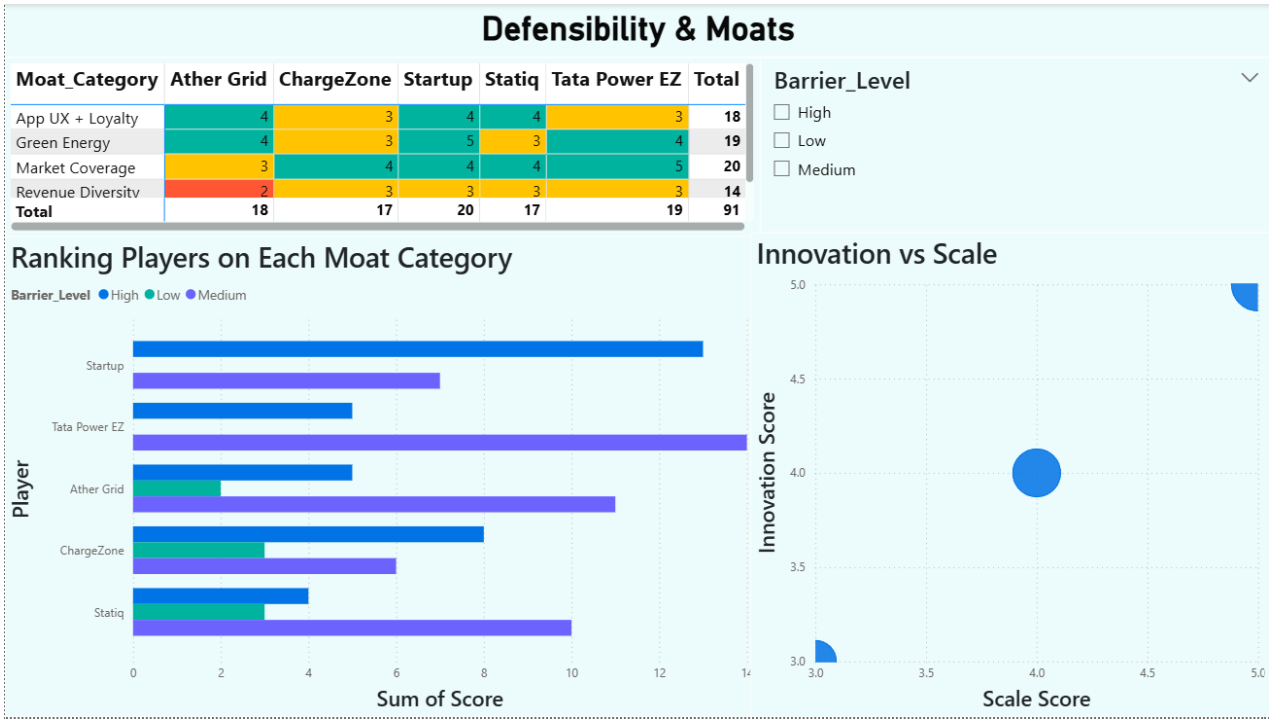


Fig. B.11.

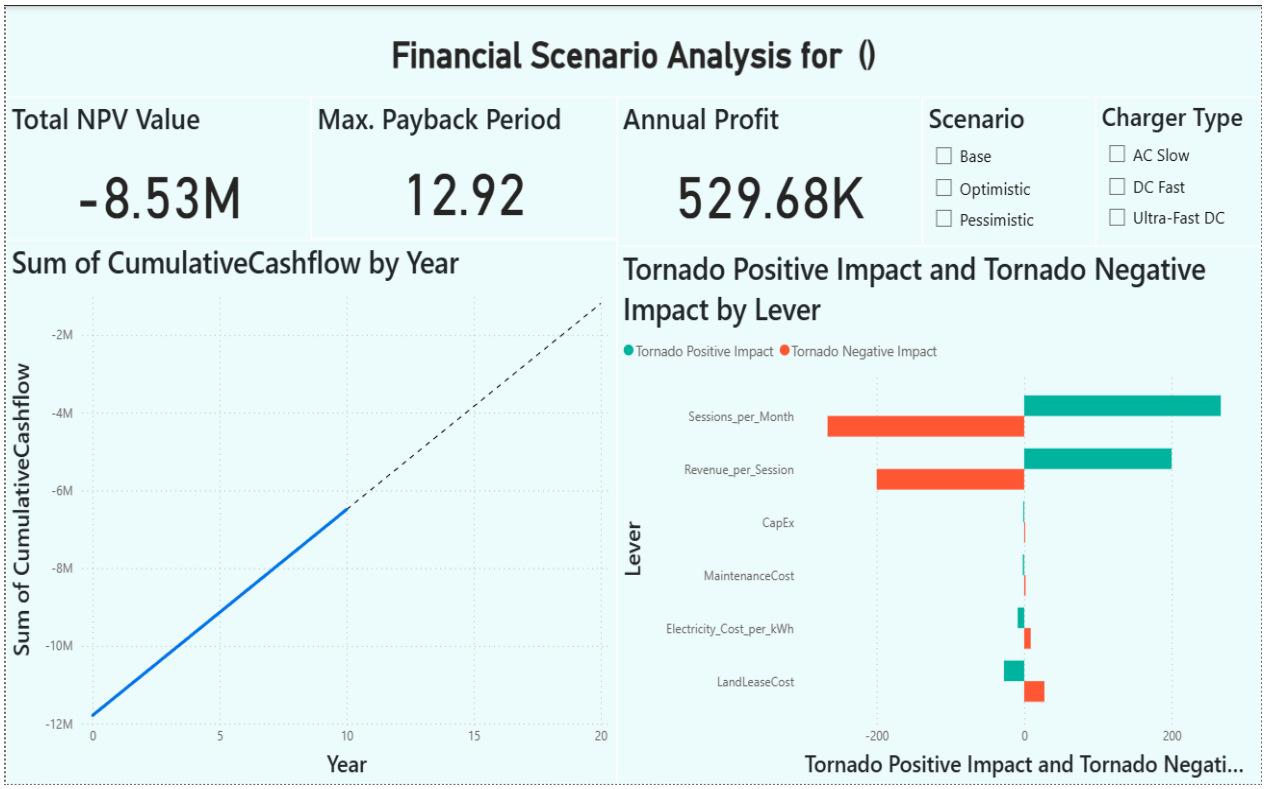


Fig. B.12.

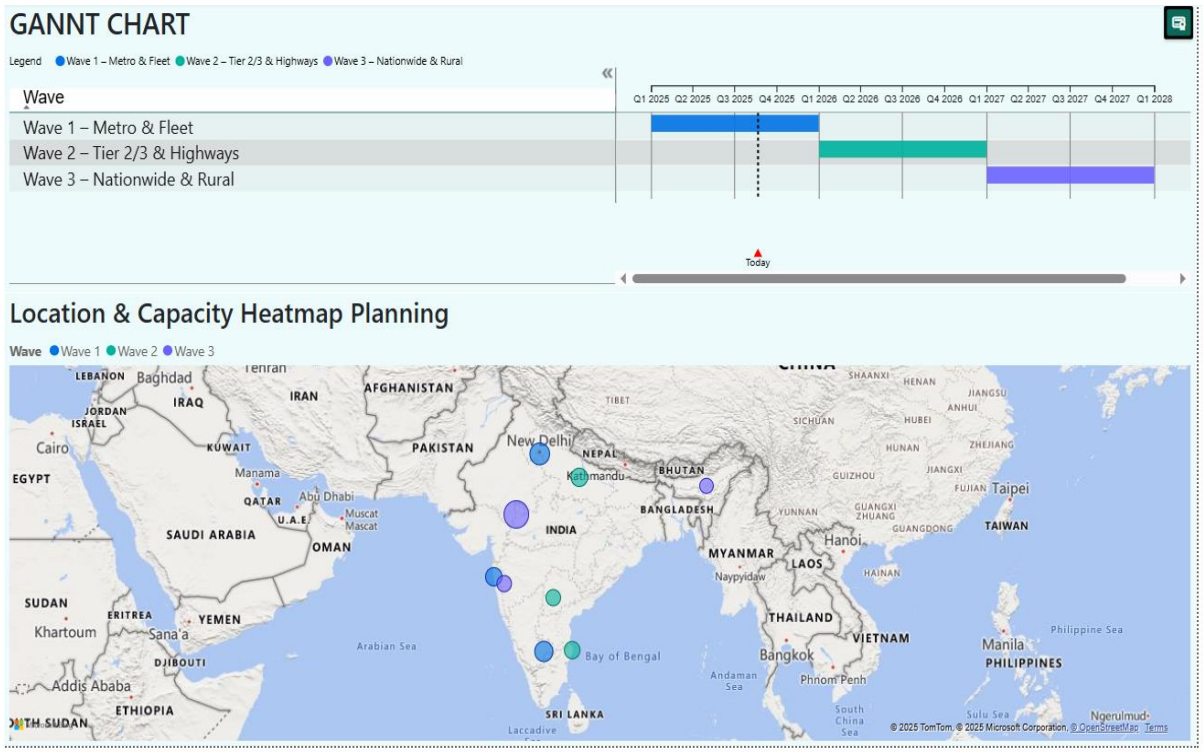


Fig. B.13.

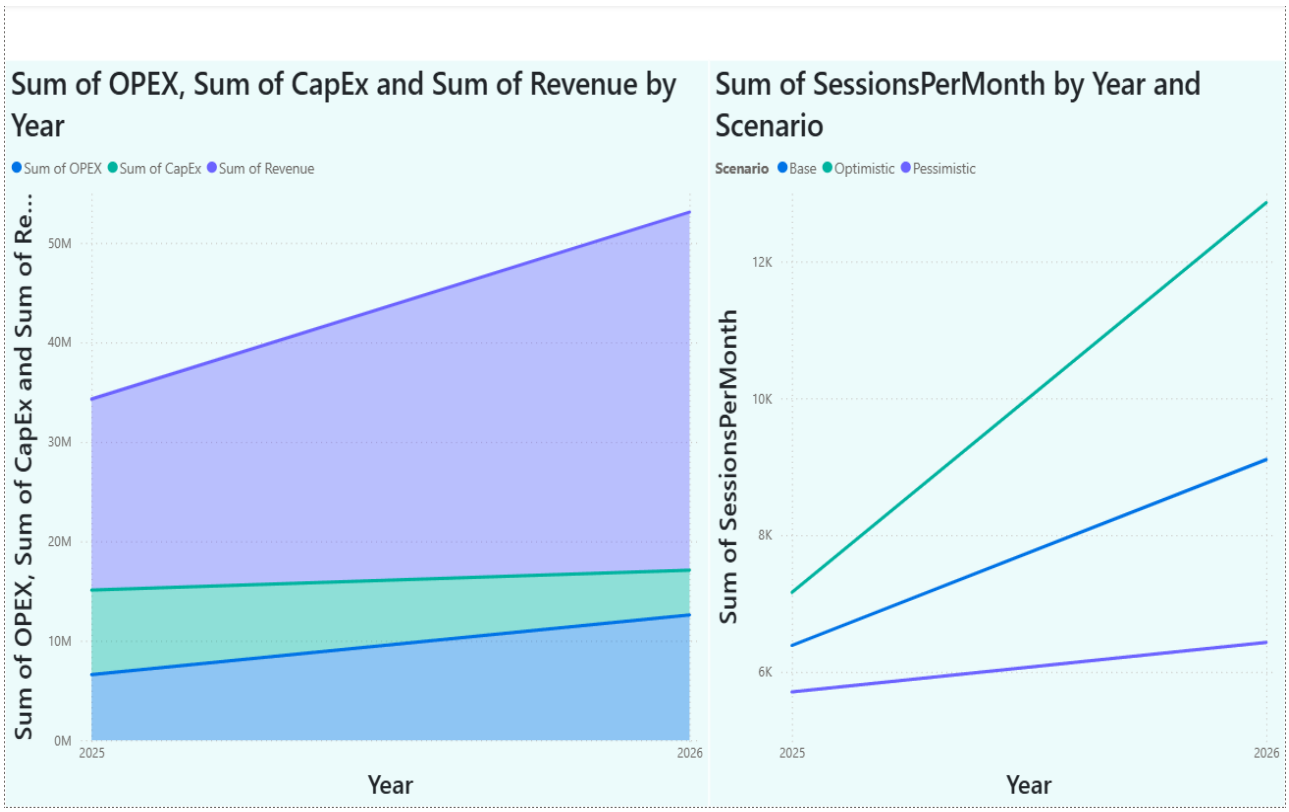


Fig. B.14.

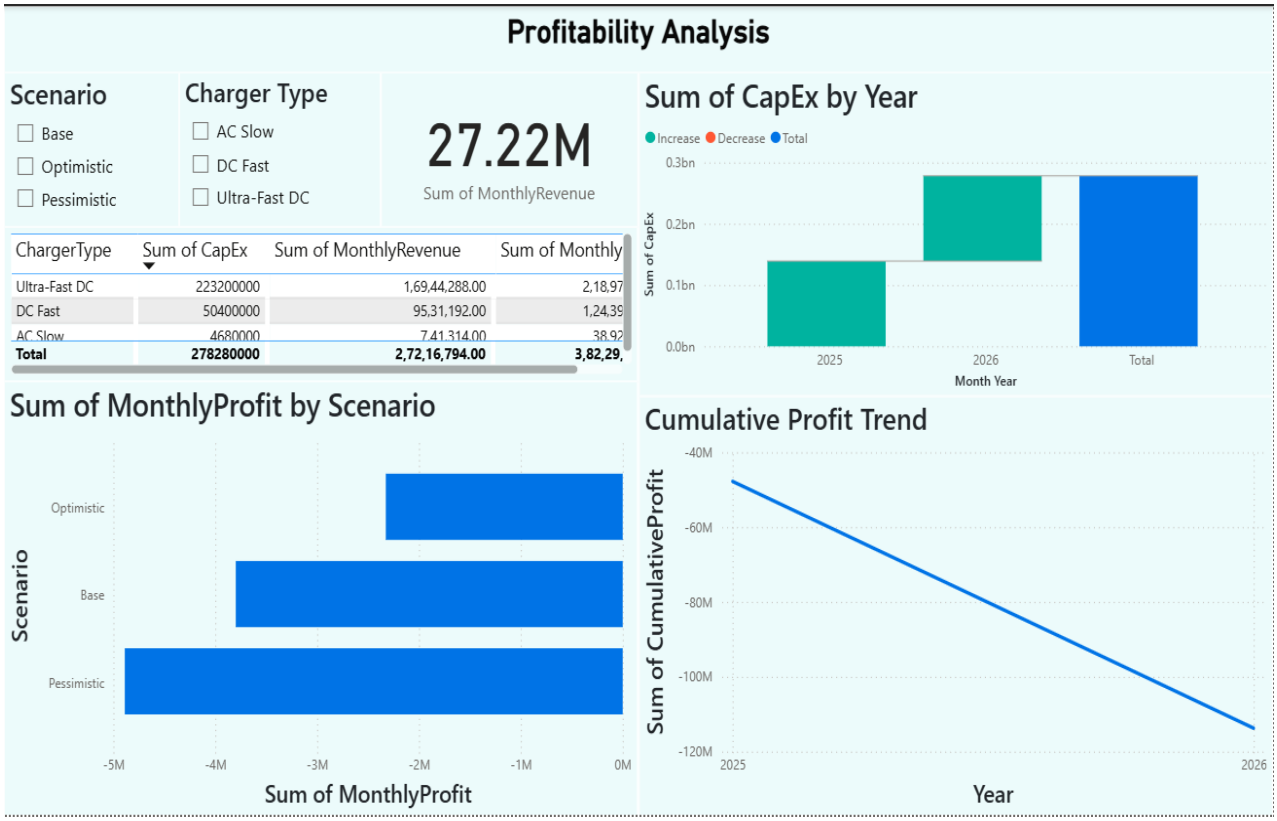
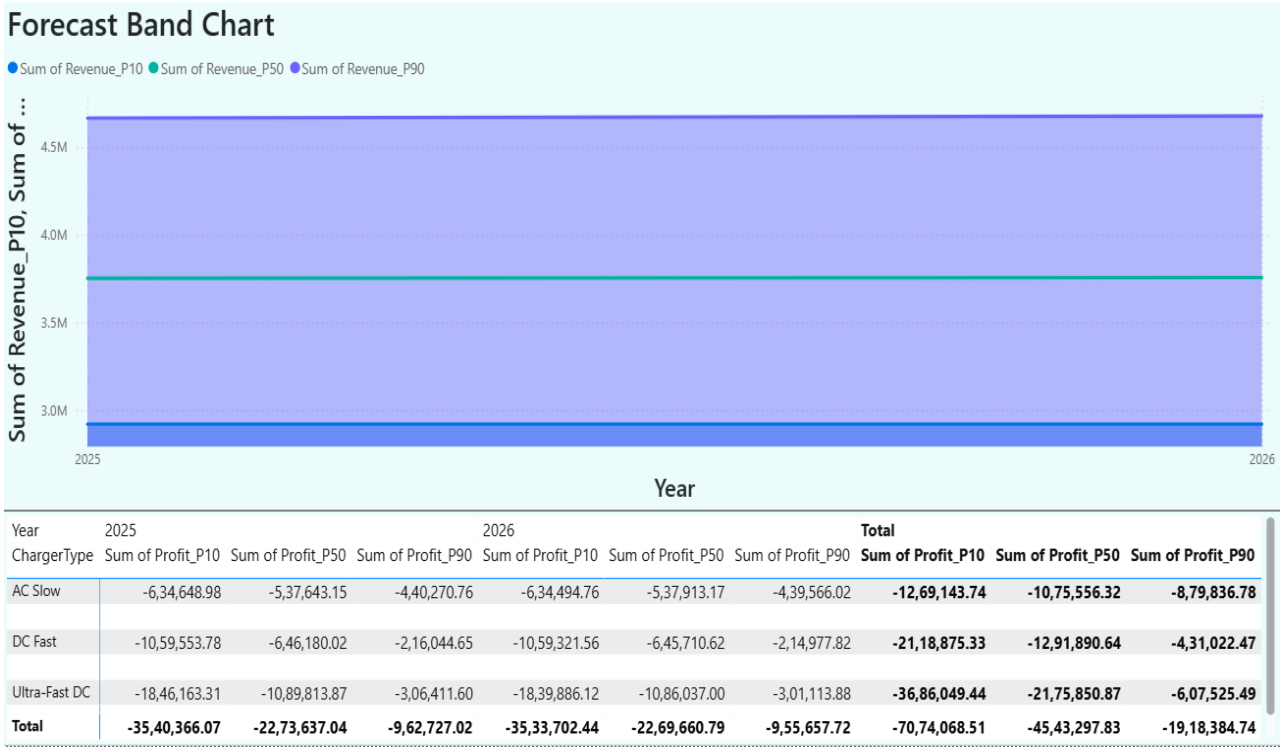


Fig. B.15.



Year	2025			2026			Total		
ChargerType	Sum of Profit_P10	Sum of Profit_P50	Sum of Profit_P90	Sum of Profit_P10	Sum of Profit_P50	Sum of Profit_P90	**Sum of Profit_P10**	**Sum of Profit_P50**	**Sum of Profit_P90**
AC Slow	-6,34,648.98	-5,37,643.15	-4,40,270.76	-6,34,494.76	-5,37,913.17	-4,39,566.02	**-12,69,143.74**	**-10,75,556.32**	**-8,79,836.78**
DC Fast	-10,59,553.78	-6,46,180.02	-2,16,044.65	-10,59,321.56	-6,45,710.62	-2,14,977.82	**-21,18,875.33**	**-12,91,890.64**	**-4,31,022.47**
Ultra-Fast DC	-18,46,163.31	-10,89,813.87	-3,06,411.60	-18,39,886.12	-10,86,037.00	-3,01,113.88	**-36,86,049.44**	**-21,75,850.87**	**-6,07,525.49**
Total	**-35,40,366.07**	**-22,73,637.04**	**-9,62,727.02**	**-35,33,702.44**	**-22,69,660.79**	**-9,55,657.72**	**-70,74,068.51**	**-45,43,297.83**	**-19,18,384.74**

Fig. B.16.

Dax Measures:

- TotalRevenue = SUM(Financials[MonthlyRevenue])
- TotalOPEX = SUM(Financials[MonthlyOPEX])
- ROI % = DIVIDE([CumulativeProfit], [CapEx], 0)
- PaybackPeriod = CALCULATE(MIN(Financials[Month]), FILTER(Financials, [CumulativeProfit] > 0))
- CumulativeProfit = CALCULATE(SUM(Financials[MonthlyRevenue] - Financials[MonthlyOPEX]), FILTER(ALL(Financials), Financials[Month] <= MAX(Financials[Month])))
- ProfitMargin % = DIVIDE(SUM(Financials[MonthlyRevenue] - Financials[MonthlyOPEX]), SUM(Financials[MonthlyRevenue]), 0)
- ScenarioSelector = SELECTEDVALUE(Scenarios[ScenarioName])
- Percentile_10 = PERCENTILEX.INC(Forecast[Profit], 0.1)
- Percentile_50 = PERCENTILEX.INC(Forecast[Profit], 0.5)
- Percentile_90 = PERCENTILEX.INC(Forecast[Profit], 0.9)

Appendix C: Detailed Financial Model Tables

This appendix consolidates the financial modeling outputs generated in Phase F (Financial Model & Business Plan) and extended through Phase H-0 (Stress Testing).

It includes per charger type economics, and scenario stress-tests.

The intent is to provide a comprehensive data backbone behind the strategic financial recommendations.

Charger Economics Summary (Per Unit, Monthly Averages)

Charger Type	Power Rating	CapEx (₹)	Avg. Monthly Revenue (₹)	Avg. Monthly OPEX (₹)	Payback Period (Years)
AC Slow	3.3–7 kW	55,000–75,000	7,000–9,500	5,000–6,500	4.0–5.0
AC Fast	7–22 kW	90,000–3,00,000	12,000–18,000	8,000–14,000	3.5–4.5
DC Slow	15–30 kW	3,00,000–10,00,000	25,000–55,000	15,000–30,000	3.5–4.2
DC Ultra-Fast	120–360 kW	20,00,000–48,00,000	1,20,000–2,50,000	80,000–1,25,000	3.0–3.8

Stress Testing (Phase H-0)

Conducted sensitivity testing for:

- Utilization ±20%
- Tariff ±15%
- OPEX ±20%

Outputs:

- ROI sensitivity range: 8% → 18%.
- Payback shifts: ± 8–12 months under shocks.
- Ultra-Fast DC remains most resilient across all stress scenarios due to scale economics.

Appendix D: Scenario Modelling Inputs & Assumptions

This appendix provides the quantitative backbone for the financial projections and scenario modeling.

While the main report only highlights revenue, ROI, and payback timelines, here we include all input datasets, scenarios, and stress assumptions used to drive the models.

Assumptions for the Financial Viability Model:

Parameter	AC Charger (Level 2)	DC Fast Charger	Notes
Installation Cost (one-time)	₹1,00,000 (midpoint of ₹60K–₹1.3L)	₹12,00,000 (midpoint of ₹7L–₹17L)	Excludes land lease for now
Revenue per Session	₹150	₹300	DC sessions priced higher due to faster charging
Average Sessions per Day	4	6	Higher utilization for DC
Annual Operating Cost (power + maintenance)	₹1,00,000	₹1,50,000	Excludes land lease (which we'll model separately if needed)
Target Payback Period	3–5 years	3–5 years	Industry-aligned

Table E.1.

EV Charging Infrastructure Policy Summary – India:

Policy Area	Issuing Authority / Standard	Date / Period	Key Interventions / Clauses
1. De-licensing of Charging	Ministry of Power (MoP)	2018 (updated in 2022)	Charging station setup is a de-licensed activity; open to all entities; must follow technical/safety standards.
2. Electricity Connection Timelines	MoP / State Regulators	Ongoing (central guideline)	Fast-track connections: • Metro: 3–7 days • Urban: 15 days • Rural: 30 days
3. Tariff Guidelines (ACoS Cap)	MoP	Until March 31, 2025 (extended to 2028 by many states)	Single-part tariff capped at Average Cost of Supply (ACoS); Time-of-Day (ToD) pricing: • 30% discount during solar hours (9 AM–4 PM) • 30% surcharge outside solar hours
4. Open Access Power Procurement	MoP	Introduced 2018+	EV charging stations can source power via open access (e.g., renewable) to reduce costs.
5. Land Provisioning	MoP / Urban Local Bodies	2018 onward	• Govt/public land lease at ₹1.0/kWh revenue-sharing model for up to 10 years. • Zoning support from municipal authorities.
6. National Network Coverage Plan	MoP / NITI Aayog	Policy Objective (Phased)	Target: 1 charging station per 3km x 3km urban grid, and every 25km along highways.
7. Technical & Safety Standards (Charging)	BIS / MoP / BEE	Ongoing (IS17017, IS15118)	Emphasis on interoperability, technology neutrality, adherence to safety & communication standards.
8. Data Sharing & Transparency	Bureau of Energy Efficiency (BEE)	2022+	Mandated real-time data sharing by charge point operators (CPOs) to BEE's **EV Yatra portal** and API platforms.
9. Customer Convenience	MoP + State Nodal	2021–ongoing	Mandated 24/7 station ops (where possible); must integrate

	Agencies		with at least one e-Network Provider (e.g., EV app); cap on service charges.
10. Battery Swapping Promotion	NITI Aayog / MoP	2022 (Battery Swapping Policy - Draft)	Focused on 2W/3W segment; encourages "Battery-as-a-Service" (BaaS); permits reuse of existing power connections.
11. CEA Technical Safety Norms (BESS + Charging)	Central Electricity Authority	Draft 2025 Amendment	Mandates: • Fire/explosion suppression • Hazard detection • Emergency shutdown • CCTV/security • 3rd-party fire audits
12. ARAI EV Connector & Shutdown Standards	Automotive Research Association of India (ARAI)	Ongoing	Regulates standardized connectors, auto fallback shutdowns, voltage fault protections.
13. Bharat EV Charger Standards (BEVC-AC001 & DC001)	BIS / MoP / NITI Aayog	2018–2023	• AC001 for L1/L2 chargers • DC001 for fast chargers • Safety + interoperability via ISO 15118
14. DISCOM Responsibilities & Smart Grid Role	State Electricity Regulators / DISCOMs	Ongoing	Must provide connection within prescribed days; regulate tariff/service charges; integrate smart meters and demand response tools.

Table E.2.

Revenue Assumptions

Charger Type	Avg. Pricing (₹/kWh)	Avg. Revenue/Session (₹)	Sessions/Month
AC Slow	**10–12**	**50–80**	**80–120**
AC Fast	**12–14**	**100–150**	**100–180**
DC Slow	**14–18**	**250–300**	**90–200**
Ultra-Fast DC	**18–22**	**500–900**	**120–300**

Table E.3.

Scenario Modelling (Phase H-0 Stress Testing)

We designed three financial scenarios to stress-test projections:

Scenario	Utilization (Sessions/mo)	Tariff (₹/kWh)	OPEX Inflation (YoY)	Notes
Optimistic	**+25% vs base**	**+10%**	**3%**	**High EV adoption, strong infra utilization**
Base Case	**Industry standard**	**Standard**	**5%**	**Conservative, policy-aligned**
Pessimistic	**-30% vs base**	**-10%**	**8%**	**Low adoption, higher costs**

Table E.4.

Monte Carlo Simulation (Phase H)

To test financial robustness, we ran 10,000 Monte Carlo iterations varying utilization, tariffs, and OPEX:

- **Utilization Range:** -30% to +30% vs base case.
- **Tariff Range**: ₹10–₹22/kWh depending on charger type.
- **OPEX Variability**: ±15% around baseline.

Stress-Test Key Insights

- **Revenue resilience:** 70% probability of positive EBITDA by Year 3 in Base Case.
- **High sensitivity to utilization:** Every ±10% change in utilization shifts ROI by ~0.8 years.
- **Ultra-Fast DC:** Payback highly sensitive to tariff fluctuations (riskier but higher upside).
- **AC Slow:** Most stable under stress tests, but lowest ROI ceiling.